The Impact of Education and Training in Large-scale Agile Transformation

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Abstract

Large-scale agile has become a very popular approach for big companies in the past ten years. There are many different frameworks on how to handle large product development units in an agile way. Many companies have divided their units geographically to several countries and multiple development teams may work together with the same product. Due to the complexity of these large companies, organizations have implemented large-scale agile frameworks to help and make processes coherent.

Transformation process in large-scale agile companies is long-term and time-consuming process. It is a long process where management must proceed multiple actions to get the large-scale agile framework to work in the organization. One of these actions is training the employees of the organization.

This thesis literature review is based on prior research of agile software development, large-scale agile transformation, and Scaled Agile Framework. Literature review based on these three topics gives core to the research part.

There was one case organization in this study which was in the middle of the transformation process during this study. This research studies the case organization's training processes and competence of the employees related to large-scale agile. This research used the case study approach. Baseline data was collected from the case organization's employees by using quantitative questionnaires and qualitative interviews.

This study provided answers for the case organization on how the training can be handled during the transformation process. Study produced proposals on how to improve employees' training paths in the case organization.

Training plays a crucial part in the transformation process. Managers must prepare, plan, and set clear goals for the training paths. Every employee must get the large-scale agile training during the transformation process. With proper planning organizations can avoid transformation failures.

Keywords
Agile Software Development, Large-scale Agile transformation, Large-scale agile trainings, Scaled Agile Framework (SAFe)

Supervisor
PhD, Teemu Karvonen

Foreword

It has been a long journey since I started my studies in a university. This master's thesis closes the circle and I finally graduate. The whole process with the thesis was stressful but nevertheless very rewarding. I want to give special thanks to my supervisor Teemu Karvonen and my employer who were flexible about their own schedules and always helped me quickly in tight situations. The Field of the study was very interesting to investigate, and it was fascinating to follow a real organization's transformation process during the study.

I would like to thank my two friends Mikko Skarp and Petri Tanskanen, who went through the university studies with me. Great memories from the courses of bachelor's studies to the master's studies. Furthermore, thanks to Miki Parkkinen who, together with me, checked this thesis before the finalization. I am grateful for many other people as well. Family, girlfriend, friends, colleagues, thank you for all the support during my university studies.

Arttu Kärki

Oulu, April 26, 2020

Abbreviations

SAFe = Scaled Agile Framework

APO = Area Product Owner

OPO = Operative Product Owner

PO = Product Owner

RTA = Release Train Architect

RTM = Release Train Manager

RTE = Release Train Engineer

PI = Program Increment

ART = Agile Release Train

BDD = Behavior-Driven Development

TDD = Test-Driven Development

Contents

1. Introduction

Nowadays agile methods are not only used in small teams with single-team projects. In the current situation of agile development these methods are also used in large teams and large projects. According to Dikert, Paasivaara and Lassenius (2016) projects can be distributed geographically, and teams may be a lot larger than people are used to in agile methods. In traditional software development there is strict management of change and straightforward planning of what comes to implementation. Agile methods aim to help organizations to more flexible work methods (Dikert, Paasivaara, & Lassenius, 2016).

In the 13th annual state of agile report CollabNet VersionOne company collected 1319 responses from all over the world in 2019. This report gives information about the current situation of agile development globally. Respondents in this survey were employees in different kinds of companies from small to large organizations who use agile methods. 46% of respondents were working in large organizations where the company had over 5000 employees (CollabNet VersionOne, 2019). So agile methods are highly used in large companies which these methods were not primarily designed for in the beginning of design agile practices.

Large companies still want to adopt agile practices to their companies, because competition in the IT-sector is tough nowadays. CollabNet VersionOne (2019) listed that, top reasons for adopting agile nowadays are accelerated software delivery, enhanced ability to manage changing priorities and increased productivity. The adopting and scaling are still a huge process for large companies. Main challenges of scaling agile in large companies are as follows: organizational culture being at odds with agile values, general organization's resistance to change and inadequate management support and sponsorship (CollabNet VersionOne, 2019).

Prior research of large-scale agile focuses mainly on systematic literature reviews of the agile development and case studies of the big companies in large-scale agile transformation.

1.1 Purpose

Purpose of this research was to investigate what was the situation of large-scale agile trainings during the transformation process in one big IT-organization in October 2019 and what is the current situation in the March of 2020 after large-scale agile trainings were held to the Product Owners, Release Train Managers, and some Scrum Masters in the organization. This organization's managers offered the possibility to follow the journey inside the company during the large-scale agile transformation. This transformation started already in 2017 but there was a lack of actions to complete this transformation then. In the beginning of 2019, the transformation process kicked off again and in autumn 2019 managers decided to start the training for these key roles of large-scale agile to get better results using the modified agile framework in software development. The second purpose of this research was to give some perspective to the organization's managers on how the organization can benefit from training in large-scale agile transformation.

1.2 Motivation

Paasivaara, Behm, Lassenius, and Hallikainen mentioned that (2018) one of the main reasons why organizations do large-scale agile transformation is to reduce the time to market. Nowadays companies need to achieve rapid end-to-end deliveries and continuous deployment when they try to push new features to the market. Also, there are other significant reasons, for example improving competitiveness and reducing the unnecessary bureaucracy in the organization. Companies have noticed that they have problems in different management areas like people management and project management. Companies who have problems in this field aim to get help from large-scale agile transformation (Paasivaara, Behm, Lassenius, & Hallikainen, 2018). According to Korhonen (2013) before agile transformation, organizations must know which kind of large-scale agile method company should adopt. Organizations might benefit from large-scale agile transformation in different ways. They may value goals differently and organizations might have different ways to achieve these set objectives. Korhonen (2013) listed three main goals in strategic point of view in agile transformation. First goal is that the company should be fast and responsive to change. Second is that the company should improve their productivity and third goal is that products have been created with distinction and integrity (Korhonen, 2013).

Adopting agile practices is not an easy task for smaller organizations either. Even though the agile methodologies are widely used in software development, organizations still struggle with the adoption of agile practices (Yu & Petter, 2014). Paasivaara et al. made a case study from Ericsson in 2018. They faced many challenges and mitigations in large-scale agile transformation. The challenges were for example the lack of a common agile framework, lack of coaching and coaches, the lack of agile training and cross-site teams (Paasivaara, Behm, Lassenius, & Hallikainen, 2018).

1.3 Research question and method

Motivation for this research is that prior research has given references on the importance of training in large-scale agile companies. Large-scale agile transformation is a very wide topic where training is one of the success factors. In many previous studies related to the transformation process, training is an important factor in the transformation process's failure or success. There are not many prior studies which focus deeper on the impact of training in the large-scale agile transformation. That is why this topic is important for the further studies and giving information related to this study field.

Research questions in this study are more human-oriented. This study will not measure financial profit or actual processes' results in the case organization. This study investigates employees' competence before the trainings which were held during the autumn 2019 and employees' training path during the transformation process. Study gives proposals to the organization on what things should be considered during the transformation process regarding the training. Research questions are:

> RQ1: How to improve the implementation of large-scale agile transformation through training?
>
> RQ2: Is it mandatory to provide large scale agile trainings to all employees who are involved in the transformation process?

In this case study the research questions were mainly chosen after discussions with company managers. First time transformation related data was gathered in 2017 by managers who worked at that time. This 2017 collected data was gathered with a questionnaire and the author of this study was not participated in this data collection. In the beginning of October in 2019 Product Owners had a two-day large-scale agile training. Employees' competence was measured before this training period by sending a questionnaire to the Product Owners. Then in the first quarter of 2020, semi-structured interviews were held for four persons. After all these data collections, data was measured, and solutions were proposed for the future trainings.

1.4 Structure

This thesis starts with related research and background of large-scale agile development and its transformation for the large organizations. Related research contains both agile software development methods and how these methods can be used in the large-scale agile. Related research part focuses on large-scale agile transformation. It gives the viewpoint of motivation of large-scale agile transformation and success factors of transformation. This part also gives a high-level overview of normal agile principles and methods and a high-level view of the large-scale agile frameworks which are commonly used in the big organizations nowadays. This research is focused on Scaled Agile Framework (SAFe), so it also has its own subchapter in literature review.

Third chapter gathers research methods which have been used in this study. It contains information about research methods, research design and data gathering methods. Fourth chapter contains the results and findings of this study. Fifth chapter is discussion and the last chapter is the conclusion chapter of the study.

2. Related Research and Background

This chapter first goes through the traditional agile software development and what is agile methods. After that there is view of the large-scale agile which differs from the traditional agile software development. After that there is a subchapter for large-scale agile transformation and SAFe.

2.1 Agile software development

According to Dingsøyr, Nerur, Balijepally, and Moe (2012) the basis for agile software development comes from the agile manifesto, which was created in 2001. The Agile manifesto lists four different main values which were not new things when the manifesto was written, but it was the first time when those four main values were gathered to support the agile thinking (Dingsøyr, Nerur, Balijepally, & Moe, 2012). Beck et al. (2001) lists these four main values in Agile manifesto in the following manner: "Individuals and interactions over processes and tools. Working software over comprehensive documentation. Customer collaboration over contract negotiation. Responding to change over following a plan." (Beck *et al*., 2001). According to Dingsøyr et al. (2012) the first principle emphasizes people collaboration. Before agile development, processes constrained people's flexible teamwork. In second principle, manifesto creators try to avoid unnecessary extra work like redundant documentation. In some contexts, this principle is understood that there is no space for documentation at all, but that is not true. Documentation should be done only for the necessary parts of the development. The third principle of agile manifesto is that customers of the product are actively involved in the evolution of the software product. The fourth principle is that uncertainties in the development process are acceptable. These four values are not strict rules of using the agile methods. These values are more like guidelines to put agile into practice in organizations. The main core idea of the agile software development is that self-organizing teams can work at a pace that keeps their creativity and productivity at the same time. Leanness of bureaucracy and flexible implementation inside teams plays a huge role in agile development (Dingsøyr, Nerur, Balijepally, & Moe, 2012). Behind these four core values in the agile manifesto, there are 12 principles. The Four core values and methods follow these principles in it (Beck et al., 2001). These 12 principles are listed in Figure 1.

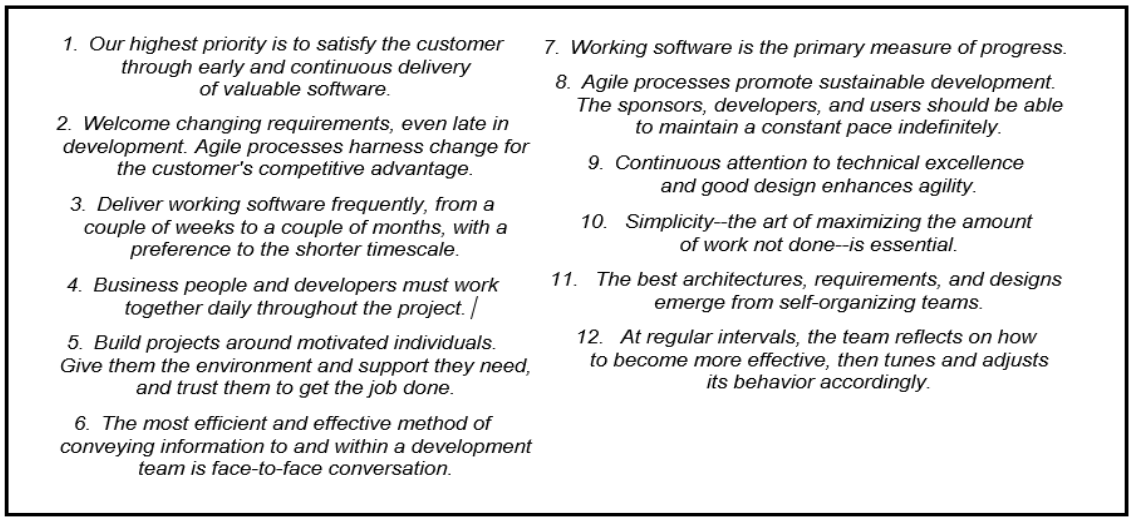

Figure 1. Principles behind the agile manifesto (Beck et al., 2001)

Yu and Petter (2014) states that there is not only one way to do agile software development. Software developers started to create agile software development methodologies before the agile manifesto in the late 1990s. Even though there are a lot of agile methods, the most common methods are Extreme Programming (XP), Scrum and Kanban. Every agile method has their own way of working even though all those methods have the same base values which are listed above. For example, Scrum focuses more on management practices and Extreme Programming focuses on practices which are related to team activities. Both of these methods support adapting to the changing requirements from customers and also reducing risks in the development phase (Yu & Petter, 2014).

2.2 Definition of large-scale agile development

According to Paasivaara et al. (2018) when agile software development methods came to publicity in 2001, those methods were originally intended mostly for smaller companies. In larger organizations agile methods raise several challenges. The challenges arise when software development needs interaction between multiple development teams. These development teams may be even in different locations geographically. What comes to ordinary agile development, it focuses mostly on intra-team way of working. In larger organizations methods must be tailored. When multiple teams work in the same software development process, formal communication methods may be necessary, and this will reduce the main idea of the agile software development (Paasivaara, Behm, Lassenius, & Hallikainen, 2018). Dikert, Paasivaara, and Lassenius (2016) stated that larger projects need more strict coordination which battles against the idea of originally created agile methods. One of the key principles of the agile methodology is that documentation of the development should be limited. In larger organizations formal documentation is still very important because of the dependencies between multiple teams inside the same organization (Dikert, Paasivaara, & Lassenius, 2016).

Large-scale agile development can be described by a couple of different metrics (Dingsøyr et. al 2018). Dingsøyr et. al (2018) talks about large-scale agile and very large-scale agile. In both terms, the organization has many developing teams in multi-team projects which use agile principles in the whole organizational level. If a project or an organization has more than two developing teams it can be called a large-scale agile development. If a project or an organization has impact on more than ten teams, then it can be called a very large-scale agile development (Dingsøyr et. al 2018). Still there is not a straight blueprint of what are the main definitions of a large-scaled agile company (Paasivaara, Behm, Lassenius, & Hallikainen, 2018).

CollabNet VersionOne (2019) states that nowadays there are many scaling methods and approaches. In the 13th annual state of agile report there is listed that Scaled Agile Framework (SAFe) is the most used scaling method in agile organizations in the whole world. Other used large-scaling methods are example Large Scale Scrum (LeSS), Disciplined Agile Delivery (DAD), Agile Portfolio Management (APM) and Nexus. Also 8% of the respondents said that they use internally created methods, which have been modified by the organization's own needs (CollabNet VersionOne, 2019). According to Kalenda, Hyna, and Rossi (2018) organizations choose large-scale agile framework based on their needs and the size of organization. Example SAFe is designed for use of 50-120 people in on release train while Nexus is designed for use of 3-9 Scrum teams (Kalenda, Hyna, & Rossi, 2018).

Large-scale agile frameworks use originally implemented agile methods inside teams, example Scrum and Kanban (C. Ebert & M. Paasivaara, 2017). Extreme programming is

also one of the agile methods. These methods can be called the global standard methods in software development (Schuh et al., 2018).

2.3 Large-scale agile transformation success and failure factors

When an organization implements large-scale agile transformation, it affects multiple individual's daily work and that is why during the transformation the organization will face challenges (Paasivaara, Behm, Lassenius, & Hallikainen, 2018). Turetken, Stojanov, and Trienekens (2017) states that there is a lack of clear structured roadmaps on how to proceed transformation processes in large-scale agile frameworks. Example companies who want to adopt SAFe practices to their organization might face problems while identifying the priorities in the transformation process. SAFe only offers best practices, roles, and principles but it is not offering implementation strategy or methods (Turetken, Stojanov, & Trienekens, 2017). Paasivaara et al., (2018) listed over 25 factors which have been identified in 2016. Main challenges during the transformation are that other functions are not willing to change, lack of guiding literature during the transformation, people are still more likely to work with old ways and misunderstanding the principles of agile methods. The most meaningful factors to success were coaching teams at the same time when they are learning the agile transformation, guaranteed management support during the transformation and customizing the agile approach to fit correctly the organization needs (Paasivaara, Behm, Lassenius, & Hallikainen, 2018). Korhonen (2013) also listed three important factors. These three factors are important to get agile transformation successfully to the finish. These factors are culture, people, and communication tools in the organization. Large-scale agile transformation could be a long process and it might take a few years from start to finish to implement full transformation in a software development company (Korhonen, 2013).

There are a couple of core findings which Paasivaara and Ebert (2017) listed in their scientific article about scaling agile. The first notice is that all the employees must have the same mindset about scaled agile in their organization. It is not pushing transformation forward in the right way if a company just takes a couple of parts from large-scale agile frameworks. The transformation should be included in organizational culture. The second notice is that an organization should adapt all the processes, roles and tools which come from the framework that is used (C. Ebert & M. Paasivaara, 2017). Pries-Heje & Krohn (2017) mentioned that one of the major challenges in transformation is that some of the old roles will be obsolete with new roles after the transformation process. Moving to new roles might be a big challenge in some cases during the transformation. That is why it is important to adapt all the information from the framework used (Pries-Heje & Krohn, 2017). Paasivaara and Ebert (2017) states that the transformation cannot only be done by team level, it should be done in the whole organization. The transformation requires the presence of every employee (C. Ebert & M. Paasivaara, 2017).

According to Olszewska, Heidenberg, Weijola, Mikkonen, & Porres (2016) prior study related to agile transformation, there are quantitative metrics on how to measure large-scale agile transformation processes. In this prior study Olszewska et al., (2016) measured one case organization which had 350 employees in two sites. In this prior study there were eight different metrics and all the metrics had an indicator for success. These metrics measured money spent in the organization and time intervals related to organization basic work. Metrics compared the organization's old way of working and new way of working. There were significant results of improvements (Olszewska et al., 2016). Olszewska et al. (2016) reported that case organization's number of releases compared to used time increased +400% after the transformation process. Also, functionality per money spent

increased +483%. Correspondingly, time of feature development decreased by -64% (Olszewska et al., 2016).

2.4 Scaled Agile Framework (SAFe)

According to Laanti and Kettunen (2019) Scaled Agile Framework (SAFe) is the most popular model of agile scaling models. SAFe was first launched in the Agile conference in 2011 (Laanti & Kettunen, 2019). Dean Leffingwell has designed SAFe (Putta, Paasivaara, & Lassenius, 2018). The SAFe was developed to help organizations scale their agile practices across the enterprise (Razzak, Richardson, Noll, Canna, & Beecham, 2018). According to Laanti and Kettunen (2019) the SAFe is adopted in 29% of organizations when comparing the usage rates of large-scale agile models in big organizations. Benefits that the organizations gain by using the SAFe model are improvement in employee motivation, increase in productivity, reduction in defects and faster time-to-market (Laanti & Kettunen, 2019).

2.4.1 Agile Release Train in SAFe

Uludag, Kleehaus, Xu, and Matthes (2017) states that SAFe extends Scrum by using Scrum ideas in the higher level than only team level. This means that Scrum kind of elements are also used at the program level (Uludag, Kleehaus, Xu, & Matthes, 2017). At the program level SAFe framework uses Agile Release Trains (ART). These ARTs allow organizations to develop large-scale systems by using SAFe practices (Alqudah & Razali, 2016). According to Putta et al. (2019) first organization identifies their value streams and after that teams are grouped into release trains. These release trains include agile teams, long-lived organization structures, key stakeholders and other resources which are significant for the release train. These agile release trains include approximately 50-125 people. Release trains deliver their solutions in program increments (PIs) which are mainly eight to twelve weeks long, depending on the organizational decision. Agile release trains have three different approaches to handle value streams and delivering products or services (Putta et al., 2019). Putta et al. (2019) presents these three approaches in the following manner: “A single agile release train delivering a single value stream. A single agile release train delivering multiple value streams. Multiple agile release trains delivering a single large value stream.” If multiple agile release trains are delivering a single large value stream, then these agile release trains have a lot of dependencies with each other. In this approach, release trains can deliver different features to one value stream. Example this can be used in large software (Putta et al., 2019).

In the beginning of every program increment release train has planning meetings together where they decide their common vision of the coming program increment (Putta et al., 2019). In planning meetings, agile release train decides together which features they can implement during the program increment and deliver after program increment (Scaled Agile Inc, SAFe, 2020). Figure 2 shows the flow of Agile Release Train. (Scaled Agile Inc, SAFe, 2020)

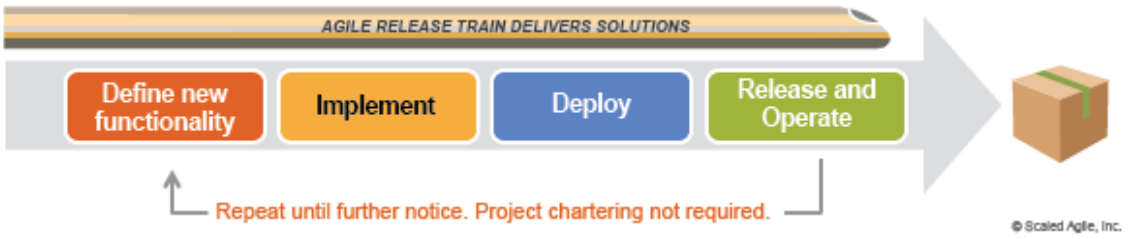

Figure 2. Agile Release Train (Scaled Agile Inc, 2020)

Putta et al. (2019) states that during the program increment, every developing team works with their own backlog items which have been planned in the PI planning. Developing teams follow the basic agile practices. Teams can handle the backlog by using basic Scrum practices or Kanban methods (Putta, Paasivaara & Lassenius, 2019). Scaled Agile Inc (2020) reports that developing teams in agile release train are cross-functional. This means that there are no longer specific persons to do prescribed tasks. As shown in Figure 3, everyone in the team can define, build, test, or deploy their components (Scaled Agile Inc, SAFe, 2020).

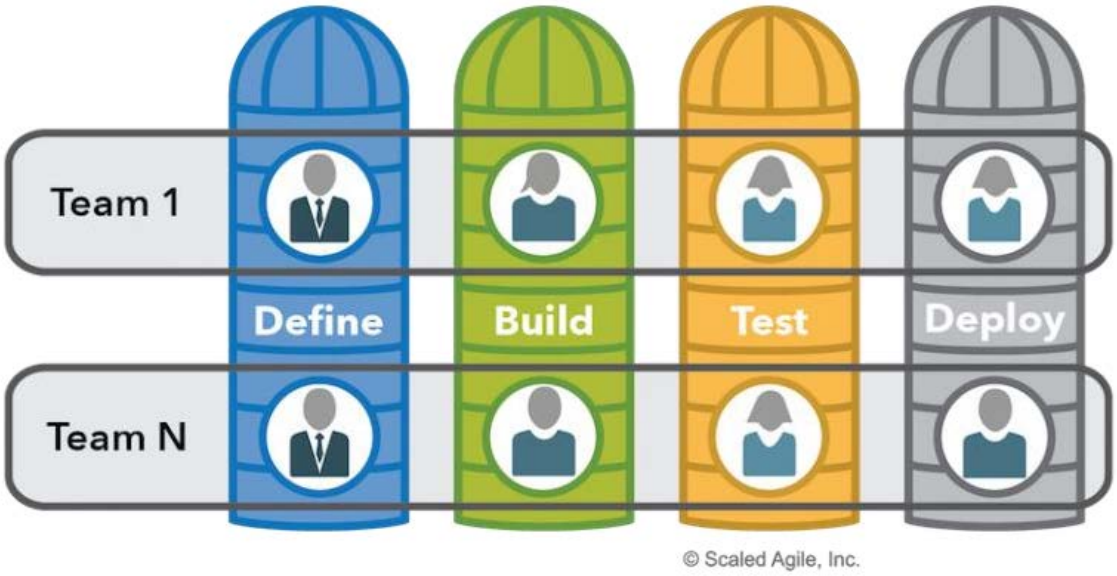

Figure 3. Cross-functional Agile team (Scaled Agile, Inc 2020)

According to Scaled Agile Inc (2020) every team has their Scrum master who is named a "leader" of the team. It means that Scrum master facilitates meetings, looking at how the team uses agile practices and maintains the team's focus. The Scrum team works closely with the Product Owner. The Product Owner's main task is that it owns the team backlog. The Product Owner prioritizes the team's work, conveys developers' questions to the customer and collaborates with product management (Scaled Agile Inc, SAFe, 2020).

Above the team level there are many additional roles in SAFe (Paasivaara, 2017). Scaled Agile Inc (2020) mentioned that one role in the top of the ART is Release Train Engineer (RTE). Even though the SAFe does not have a prescribed reporting structure, the RTEs report to the program managers. Program Increment related activities are the main responsibilities for the RTEs. They facilitate and plan the PI planning events and manage the flow of value in ARTs. One of the key roles in the SAFe is Solution Architect. Solution Architects' responsibilities are taking care of Continuous Delivery Pipeline and

defining subsystems and interfaces. They participate in the planning and development of the architectural runways (Scaled Agile Inc, SAFe, 2020).

2.4.2 Trainings in SAFe transformation

According to Dikert et al. (2018) adopting agile to the whole organization is more complicated depending on how large the organization is. Even though agile development has practices on how to do things it still is more of a holistic way of thinking. It is important that the whole organization thinks the same way. One way to try to secure this same agile mindset for every employee is to organize large-scale agile training for the employees (Dikert, Paasivaara, & Lassenius, 2016). Razzak et al. (2018) listed that training is required in SAFe organization if the organization wants to improve vertical communication between different stakeholders in the organization. These stakeholders are teams, upper management, and program level (Razzak et al., 2018). Conboy & Carrol (2019) also listed that one recommendation to avoid transformation failure is continuous training or education opportunities to all employees no matter staff level.

According to Gandomani et al., (2015) organizations provide training during the transformation process with different methods. One of the training methods in the organizations is partial training where only some of the employees attend the training or some of the used agile framework practices are covered in the training process. Opposite of the partial training is comprehensive training which covers all the employees in the organization. Organizations can provide training from a theoretical or practical point of view. Gandomani et al., (2015) points out that employees need both theoretical and practical training during the transformation process. Theoretical training educates the employee to the selected agile methodology and practical training executes these methods in practice. Training can be organized by using fixed-time periods. This approach is called time-boxed training (Gandomani, Zulzalil, Ghani, Sultan, & Parizi, 2015). Scaled Agile Inc, (2020) provides these time-boxed trainings which vary from two to four days in length. Second approach is continuous training (Gandomani et al., 2015). Misra, Kumar and Kumar (2009) states that if employees are willing to share information between each other it helps continuous learning and continuous training. Practical training which comes from mentoring and professional discussions helps employees to execute their continuous agile training (Misra, Kumar, & Kumar, 2009). Conboy, Coyle, Wang, and Pikkarainen (2011) states that mentoring in continuous training can be produced by senior team members who have experience of agile practices. Coaching and mentoring complement the previous formal training (Conboy, Coyle, Wang, & Pikkarainen, 2011). According to Gandomani et al. (2015) time-boxed training could be helpful but continuous training is still needed during the transformation process. If an organization does not provide enough training, then employees must resort to self-training. This leads employees to use heuristic trial and error tactics. This is not acceptable in development projects but in some cases, teams use this approach in a case of emergency (Gandomani et al., 2015).

According to Conboy et al., (2011) organizations can also provide other training programs which are not strictly agile trainings but have a connection to the agile transformation. Social interaction is one thing which increases when people move to use agile practices. Customer interactions, stand-up meetings and retrospectives come with agile practices. Some employees might have problems with social interaction. Social-skills training is one solution to this challenge. Improved social skills help with the transformation process. Training related to the organization's business domain is also one of the training programs. In agile projects developers might work straight with customers. Customers might have problems trusting the developer’s overall ability if the developer does not

know the business domain of the organization at all. In this situation technical strengths might be ignored (Conboy et al., 2011).

According to Dikert et. al (2016) one of the failure factors in large-scale agile transformation is the lack of training. Training is the direct investment from the company and the lack of this investment is an obvious problem. If there is a lack of large-scale agile training in the company, it can produce difficulties during the transformation process. Lack of training can affect teams directly in a bad way. If the team does not have enough information about the large-scale agile, they might stop using agile methods entirely. This can also affect the team's motivation if they do not know the processes the organization requires (Dikert et al., 2016). In 2017 Paasivaara compared two different case organizations. The Organization which did not have any training in the beginning of the transformation resisted the change while the organization which had training in the beginning of transformation engaged employees with SAFe transformation in a positive way (Paasivaara, 2017). Paasivaara et al. (2018) states that insufficient common training may also lead the transformation to the wrong direction. Teams should use the same framework when developing products with the agile way in a large organization (Paasivaara, Behm, Lassenius, & Hallikainen, 2018). Abrar et al. (2019) believes that it is also important to train top management to agile thinking. In large scale-agile cooperative organizational culture is important and the transformation process starts from the top management. Teams should have scheduled training in the transformation process, but everything should start from briefing the top-management to agile-oriented thinking (Abrar et al., 2019).

According to Paasivaara et al. (2018) organizations should also focus on basic knowledge of agile development before large-scale agile training. Some of the employees might be very familiar with agile development but others may not. Basic training of the agile practices is necessary before the employee starts to use a modified agile framework. Employees come from various backgrounds. Some employees had used agile a lot during their work career and might have knowledge about large-scale agile already, but some employees might have never used agile methods. Company organized training should be mandatory for all the employees. These trainings are basic requirements for achieving common goals of the transformation (Paasivaara, Behm, Lassenius, & Hallikainen, 2018). In Gandomani et al., (2015) study, lack of deep understanding of Agile values was listed as one of the factors which makes the agile transformation process difficult. This creates the situation where people with lack of agile knowledge do not feel that the transformation process is significant for the organization (Gandomani et al., 2015).

2.4.3 SAFe training courses

Scaled Agile, Inc (2020) lists different SAFe trainings for different positions in an organization. Scaled Agile, Inc, which is the provider of SAFe trainings, lists 13 different courses for the SAFe transformation. These 13 different courses are divided in the three different levels of difficulty. Scaled Agile, Inc (2020) provides Foundation Level, Intermediate Level and Advanced Level courses. In the below there are four different tables which show course information. In Table 1 there are Foundation Level courses which Scaled Agile, Inc (2020) provides.

Table 1. Foundation Level courses which Scaled Agile, Inc (2020) provides

Course	Info	Prerequisites (recommended)	Learning Goals
Leading SAFe	• Two-day course • How to lead a Lean-Agile enterprise • How to establish technical agility • Supporting and executing PI Planning • Coordinating multiple Agile Release Trains	• Experience in Scrum • 5+ years' experience in software development, business analysis, product or project management, testing	• Lead the transformation to Business Agility with SAFe • Participant will become a Lean-Agile Leader • Design thinking to help to understand customer needs • Support Agile Product Delivery • Apply Lean Portfolio Management
SAFe Product Owner / Product Manager	• Two-day course • How to effectively perform Product Owner role in the Agile Release Train • How to deliver value through Program Increments • Refine Features and Stories • Manage Team backlog • Plan and execute Iterations and Program Increments	• Leading SAFe course is completed • Working in a SAFe organization • Experience with Lean, Agile or other relevant certifications	• Articulate PO / PM role • Connect SAFe principles to the PO / PM roles • Decompose Epics into Features and Features into Stories • Manage Program and Team Backlog • Collaborating with Agile teams in estimating and forecasting the work • Execute the PI
SAFe DevOps	• Two-day course • Technical, non-technical and leadership roles work together to optimize their value stream • Why DevOps is important to every role • Design continuous delivery pipeline • Working in cross-functional teams	• None	• Explain how DevOps enables strategic business objectives • Ability to release to end users on demand • Continuous testing and continuous security • Use value stream to identify bottlenecks • Select DevOps tools • Prioritize DevOps solutions for greatest economic benefit • Work with all roles and levels in the organization

Table 2 shows more Foundation Level courses. These three courses in Table 2 are more aimed for Agile Coaches and Product / Program Managers when Table 1 courses can also be taken by other roles like developers and architects (Scaled Agile Inc, 2020).

Table 2. Foundation Level courses which Scaled Agile, Inc (2020) provides

Course	Info	Prerequisites (recommended)	Learning Goals
SAFe for Government	• Two-day course • What it means to lead Lean-agile transformation inside government agency • How specific leadership behavior can drive successful organizational change	• Agile Manifesto, SAFe House of Lean and SAFe principles understanding • Understanding of full lifecycle of government technology programs • Pre-work material	• Transition government programs to use Lean-Agile and DevOps mindset • Organize government programs into ARTs and execute PIs • Large Solution coordination in multi-vendor environment • Follow success patterns for SAFe implementations
Agile Product Management	• How Continuous Exploration helps to define vision, strategy and roadmap into new markets • Accelerate product life cycle to get fast feedback • Quickly deliver products and solutions to customers	• At least one SAFe course completed • Background in Solution or Product Management	• Using Design Thinking to get desirable, sustainable and feasible outcomes • Find market needs, sizing and competitive landscape • Develop and evolve roadmaps • Apply product strategy and vision
Lean Portfolio Management	• Practical tools and techniques for implementing Lean Portfolio Management methods • Identify important business initiatives • Prioritize initiatives for maximum benefit	• Agile principles • Completed Leading SAFe or SAFE PO/PM course • Working in SAFe organization	• Describe Lean Portfolio Management (LPM) • Connect the portfolio and enterprise strategy • Coordinate value streams • Lean Budgeting • Portfolio Kanban • Measure LPM performance

According to Scaled Agile, Inc (2020) website, this company offers also more detailed SAFe courses than in Tables 1 and 2. These Intermediate courses are shown in Table 3.

Table 3. Intermediate Level courses which Scaled Agile, Inc (2020) provides

Course	Info	Prerequisites (recommended)	Learning Goals
SAFe for Teams	• What skills needed to be team member of ART • Collaborate effectively with other teams • How to write stories • Plan and execute iterations and PIs • Continuous delivery pipeline, DevOps culture	• Agile principles • Scrum, Kanban and XP • Software and hardware development processes	• SAFe to scale Lean and Agile development • Know team role in ART • Know other teams in ART, roles and dependencies between teams • Execute iterations • Plan PIs • Integrate work with other teams in ART
SAFe Scrum Master	• Role of Scrum Master in SAFe • Scrum Master role in the entire enterprise • Key components of Agile at scale development • How to execute Iteration Planning	• Agile principles • Scrum, Kanban and XP • Software and hardware development processes	• Scrum in SAFe • Facilitate Scrum events • Effective Iteration execution • Effective PI execution • Coach Agile teams for maximum results • DevOps implementation
SAFe for Architects	• What is System, Solution and Enterprise architects • Roles, responsibilities and mindset of Agile Architect • Deeper view into architecture in SAFe organization	• Completed at least one SAFe course • Participated at least one ART and PI	• Architect using SAFe • Align architecture with business value • Architect for continuous delivery • Lead and coach architects and teams during PI
Agile Software Engineering	• Modern Agile practices including XP, Behavioral-Driven Development (BDD), and Test-Driven Development (TDD) • Software engineering in larger solution context • Learn practices to detail, design, model, verify, implement and validate stories in SAFe	• SAFe for Teams course • Background in development, engineering, managing development or quality assurance	• Agile Software Engineering values, principles and practices • TDD and BDD • Test infrastructure • Design context for testability

Table 4 shows the most detailed courses which Scaled Agile, Inc (2020) offers. These courses are Advanced Level courses (Scaled Agile Inc, 2020).

Table 4. Advanced Level courses which Scaled Agile, Inc (2020) provides

Course	Info	Prerequisites (recommended)	Learning Goals
Implementing SAFe	• How to lead Lean-Agile transformation by using SAFe • How to coach programs • How to launch ARTs • How to build Continuous Delivery Pipeline with DevOps mindset • SAFe for leaders • What it takes to successfully implement SAFe	• 5+ years' experience in software development, business analysis, product or project management, testing • 3+ years of experience in Agile • At least one Agile certification	• Lead the organization to Lean-Agile transformation • Implement SAFe • Provide common language and way of working habits to organization • Launch and support ARTs • Train managers and executives in Leading SAFe • Continue managers learning journey and become enabled to train other SAFe roles in the organization
SAFe Advanced Scrum Master	• Prepares Scrum Masters in facilitating Agile team, program, and enterprise success in SAFe implementation • Cross-team interactions • Interactions with architects, product management and other stakeholders • Tools for building high-performing teams	• SAFe 5 Scrum Master certification • Certified Scrum Master certification • Professional Scrum master certification	• Apply SAFe principles in a multi-team environment • Apply Kanban and XP frameworks to improve team's work • Facilitate program planning, execution and delivery of end-to-end value
SAFe Release Train Engineer	• How to build a high-performing ART • Understanding the role and responsibilities of Release Train Engineer (RTE) • How to facilitate ART processes • Coach leaders, teams and Scrum Masters for the new mindset • How to prepare and plan PI planning event	• Have participated at least one ART and PI • Have at least one SAFe certification	• Lean-Agile knowledge and tools to execute and release value • Assist with large solution execution • Build ARTs • Develop an action plan to continue learning journey

In 2020, Scaled Agile, Inc had 347 companies in their training partners. This means that 347 different companies offered these certified SAFe trainings which were listed in the tables above. Most people had been educated by Accenture | SolutionsIQ. This company has provided training for almost 30 000 employees around the world. In Finland there were six training partners and in Finland also Accenture | SolutionsIQ had their SAFe courses (Scaled Agile Inc, 2020).

3. Research methods

In this chapter, there is an introduction of case study, quantitative, and qualitative research methods. Second part of this chapter holds information about designing questionnaires and interviews which were used in this study.

3.1 Case study

This study uses a case study approach as a research method. Runeson, Höst, Rainer, and Regnell (2012) states that case study is an observational method to do research. It is an empirical method which aims to investigate a contemporary phenomena in their frame. Case study uses multiple sources to get evidence and its purpose is to use these sources to investigate one instance. This research method investigates real-life context questions (Runeson, Höst, Rainer, & Regnell, 2012).

According to Runeson and Höst (2008) case study offers research solutions for different kinds of research purposes. These purposes are classified into four different categories. These categories are exploratory, descriptive, explanatory, and improving. Exploratory means that the case study tries to find out what is happening and tries to find new insights. Based on these findings it is generating new ideas and hypotheses which can be used in future research. Descriptive describes the current situation of the case. Explanatory tries to find explanation for a problem or situation. Mostly it tries to give an explanation in the form of a causal relationship. Last purpose of the case studies is improving. Improving tries to enhance a certain viewpoint of the studied phenomenon (Runeson & Höst, 2008). This study is mostly implemented by exploratory purposes, but it still has pieces of each purposes.

Runeson et al. (2012) mentioned that case study research data can be collected in a quantitative or qualitative way. Most case studies' data collection is provided by using qualitative methods but sometimes case studies also use a combination of qualitative and quantitative data. This approach is called methodological triangulation. Methodological triangulation approach in case study might give better understanding of the studied phenomenon (Runeson et al., 2012). This case study's data collection is provided by using this approach. According to Runeson et al., (2012) case study research process can be provided in a fixed or flexible way. In the fixed research process the parameters are defined in the beginning of the study. In the flexible research process key parameters of the study might change during the research process (Runeson et al., 2012).

Runeson and Höst (2008) states that using triangulation in a case study gives precision to empirical research. In triangulation, data collection is provided by using multiple angles. In triangulation qualitative data supports quantitative data and the other way around (Runeson & Höst, 2008). In this case study data has been collected by using methodological triangulation. According to Runeson and Höst (2008) in methodological triangulation the collected data has been combined with different collection methods. These methods are for example quantitative and qualitative data (Runeson & Höst, 2008). In this study, there were two quantitative questionnaires and one qualitative interview round. Quantitative data was collected from employees who were affected by the large-scale agile transformation and qualitative data was collected from employees who planned the transformation. Based on quantitative and qualitative findings, results were combined and proposals for the future actions were made.

3.1.1 Case study organization

This study's case organization is a big global IT-company. During this study, the company had approximately 24 000 employees all around the world. The case organization provides solutions in many different domains. These domains are for example the oil industry, financial sector, public administration, healthcare, and the car industry. This case study focuses on the case organization's specific product development unit which was distributed geographically to Finland, Sweden, and India during this study. This product development unit had approximately 200 employees when the data was collected from the employees through questionnaires and interviews. Case organization uses their own modified framework for large-scale agile. Modified framework cannot be explained in more detailed in this study because of confidentiality reasons.

The case organization fits very well to the context of this research. In the research point of view the case organization had enough employees regarding the large-scale agile, the transformation process was still in progress and the managers in the case organization asked for research results during this study.

3.2 Data collection

Data collection was done in several different steps during 2017-2020. There were two different questionnaires and one semi-structured interview round for the managers in the organization. Figure 4 shows the timeline of the data collection and training between data collection steps.

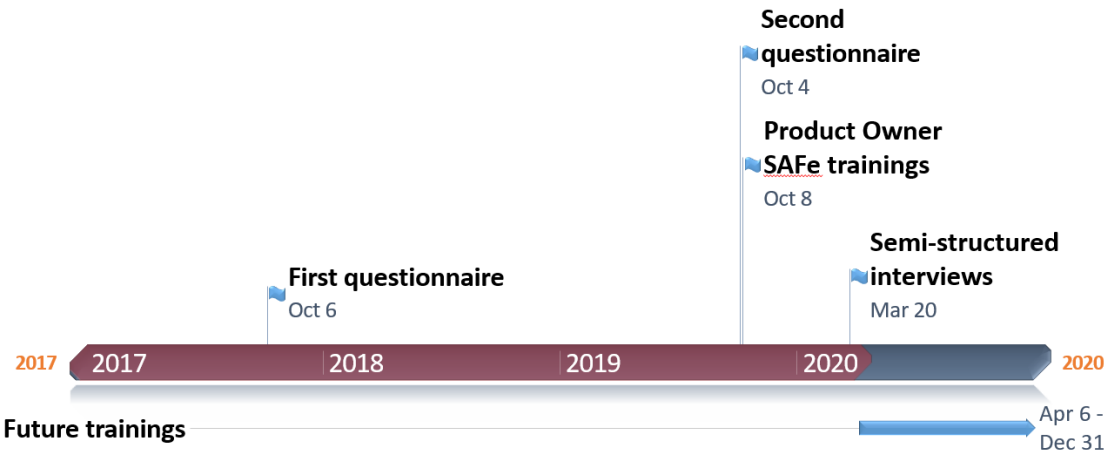

Figure 4. Timeline of the data collection process.

Timeline starts from 2017 when the first questionnaire was held for the Scrum Teams. Timeline ends at the end of year 2020. The Organization has planned that future training will be held during 2020.

3.3 Quantitative approach

According to Creswell (2009) quantitative research methods lean on numbers. It means that quantitative approach measures different kinds of variables, which can be analyzed using procedures which use statistical methods. In quantitative research variables are

characteristics or attributes which can be observed or measured. These variables can be for example gender or age. In quantitative research methods data is collected typically on instruments. Quantitative research final report is built on basic research structure. It contains introduction, prior research and theory, methods, results, and discussion in the end. Like in qualitative research, quantitative research also uses questions and hypotheses where the researcher tries to get answers by different quantitative methods. Quantitative research questions and hypotheses are mostly led by prior research which is mostly literature review in the researches. Literature review introduces the problem of quantitative research and it provides the direction of the used data gathering methods like questionnaires and experiments (Creswell, 2009).

Quantitative research has different kinds of strategies on how to collect data for research. These strategies are example surveys, experiments (Creswell, 2009). In this study there were used the questionnaires for the data collection. According to Creswell (2009) questionnaires' outcomes can be different kinds of variables which can be measured. These variables are example independent variables, dependent variables and mediating variables, Independent variables are variables that affect, cause or influence the outcome (Creswell, 2009). Independent variable is for example location of the country. Dependent variables are dependent on independent variables (Creswell, 2009). For example if research measures earthquakes in a certain country then location of the country is independent and the number of earthquakes in a year in this certain country is a dependent variable because the number of earthquakes are depending the location of the country.

According to Creswell (2009) quantitative research questions and hypotheses shape the purpose of the study. Questions in quantitative research enquire the variables' relationships. These relationships help to get answers for the researcher's questions. Hypotheses in quantitative approach are predictions which the investigator makes before research. Hypotheses are the numeric estimates of data which has been collected with quantitative research methods (Creswell, 2009).

In this study, quantitative questionnaires use Likert Scale for scaling questionnaire responses. According to Warmbrod (2014) Rensis Likert developed the Likert scale in 1932. Likert scale is used in quantitative research. The main idea of Likert scale is that first the researcher creates statements and then linear scale for the responses. Then the respondent can choose how strongly they agree or disagree with the statement. Crucial tasks in implementing the Likert scale are the wording and generation of the individual statements. After the respondent has given their responses, these answers will be calculated and summed up related to relevant items (Warmbrod, 2014).

Joshi, Kale, Chandel, and Pal (2015) lists that there are two types of constructional diversities in Likert scale approach. These types are symmetric Likert scale and asymmetric Likert scale. In symmetric Likert scale the neutral answer for the statement is exactly between two extremity answers. In asymmetric Likert scale answers can be unevenly distributed to the scale. Likert scale response continuum can also be modified. The options of the response continuum can be example 5-, 7- or 10-point scale (Joshi, Kale, Chandel, & Pal, 2015). According to Warmbrod (2014) "For example, a generic response continuum is 1 = Strongly Disagree, 2 = Disagree, 3 = Undecided or Neutral, 4 = Agree, 5 = Strongly Agree". This same scale is also used in this study.

3.4 Questionnaires in the study

For this study quantitative data was gathered by questionnaires. In the beginning of this research there were two questionnaires. One questionnaire for the Scrum Teams and second questionnaire for Product Owners. The first questionnaire was held in 2017. This first questionnaire was held for Scrum teams. For this questionnaire there were 31 Scrum teams which responded to this questionnaire. The first questionnaire questions can be found at the end of this study in the attachment section. Relevant questions are listed in Appendix A. The second questionnaire round was held for the Product Owners, before first training sessions of large-scale agile transformation in October 2019. There were 27 respondents in this questionnaire. All the questions of this second questionnaire are listed in Appendix B. These questionnaires were designed together with the organization's managers. That is why there were many questions which are not relevant with this study. Managers wanted to collect information also from the tools, technologies, and testing habits. This information was collected in the same questionnaire, but only relevant questions and results are used for this study.

Both questionnaires were implemented in Google Forms. There were eight valid questions in the first questionnaire and 27 different questions in the second questionnaire. There were three different types of questions. First question types were radio-button style questions where there was only one possibility to choose an answer. These radio-button questions were designed by using 5-point symmetric Likert scale:

1. Strongly Disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly Agree

Second question type was free form where the respondents had the possibility to write text. Third question type was a checkbox where respondents had the possibility to choose multiple answers. Even though there is a free form possibility these free form answers are divided in the structured answer categories.

3.5 Qualitative Approach

According to Myers (2020) qualitative approach helps the researcher in understanding people and the social and cultural contexts where the people live in. In contrast with quantitative research, qualitative research tries to understand human behavior. It helps to understand different actions that humans do. Example why someone acted as they did in some certain situation. In qualitative research the main point is that it is impossible to understand human behavior or other action without talking with people who join this certain action. Qualitative data sources can be for example interviews, different kinds of observations, questionnaires, and documents. Qualitative research fits best if the research field is studying social, political, or cultural aspects of people. Qualitative research is usually used on smaller populations of data sets, because data might have a wide range of information (Myers, 2020).

Myers (2020) states that one of the most common ways to collect data is interviewing. In interviews the researcher records data that the interviewee says about the topic. Interviews give us an opportunity to gather rich data about the people's behavior in various situations. Interviewer role in qualitative research helps the interviewee focus on the subject's world.

Its role is listening, encouraging, and directing the interviewee to the right path. In a case study, interviews are almost a must use technique for data gathering. There are three different types of interviews in a qualitative research approach. These interview methods are structured interviews, semi-structured interviews, and unstructured interviews. In structured interviews the interviewer uses pre-formulated questions which are strictly regulated with the order of questions. There usually is a strict timetable as well. In semi-structured interviews, the interviewer uses pre-formulated questions but there is not a strict order of the questions as long as the subject stays on the correct path. There is also the possibility for new questions if these questions are relevant during the interview. In unstructured interviews there are only a couple of pre-formulated questions and sometimes not even those. Interviewees have a free word about the subject with interviewers help (Myers, 2020).

3.6 Interviews in the study

In this study there were organized interviews for the four manager level people in the case organization. Interviews were held in March of 2020 and these four people who attended these interviews were involved in the group which drove forward the agile transformation in the case organization. The Interview was a semi-structured interview and it contained nine different topics related to large-scale agile transformation training in the case organization. Because of the coronavirus pandemic, these interviews were held on Skype for Business software. All the interviews were held in one week. Each interview's length was approximately 45 minutes for each person. All the respondents received a list of questions about a week before their interview was held. List of questions can be found from Appendix C. In that way respondents had the possibility to prepare themselves for the interviews. Interviews were recorded and then the interviews records were transcribed.

4. Results

In this chapter there is information about collected data from two questionnaires and one interview round. In this chapter the collected data is presented. Chapter presents the results of the questionnaires and interviews in the end.

4.1 First quantitative questionnaire

First quantitative questionnaire was held in October 2017. This questionnaire had 84 different questions, but this questionnaire was a general survey about the Scrum teams' habits. All the questions did not relate to this study's topic. This survey data was collected from Scrum teams, so the perspective was different than in the second questionnaire which was held in 2019. The questionnaire data was collected by managers who worked in 2017 in the case organization. The author of this study did not participate in the planning in this survey because the author was not working in the company at this moment. Even though the questions were related to general Scrum team habits, there were still general questions about large-scale agile, which gave good perspective about large-scale agile knowledge in 2017. In this questionnaire 8 different questions relevant to this study were chosen. There were respondents from Finland, India, and other countries. Largest groups were Finland and India. 58% of the respondents were located in Finland and 29% of respondents were located in India. Rest of the respondents were located in countries other than Finland or India.

In this survey there was a question about basic knowledge of Scrum. Most of the teams feel that they have good knowledge about Scrum. 17 of the teams answered option four which is between neutral and agree. Two of the teams feel that they understand Scrum very well. These two teams answered option five. Ten of the teams answered option three which is basically a neutral response and only two of the teams answered option 2. This result tells that the teams feel they know Scrum practices.

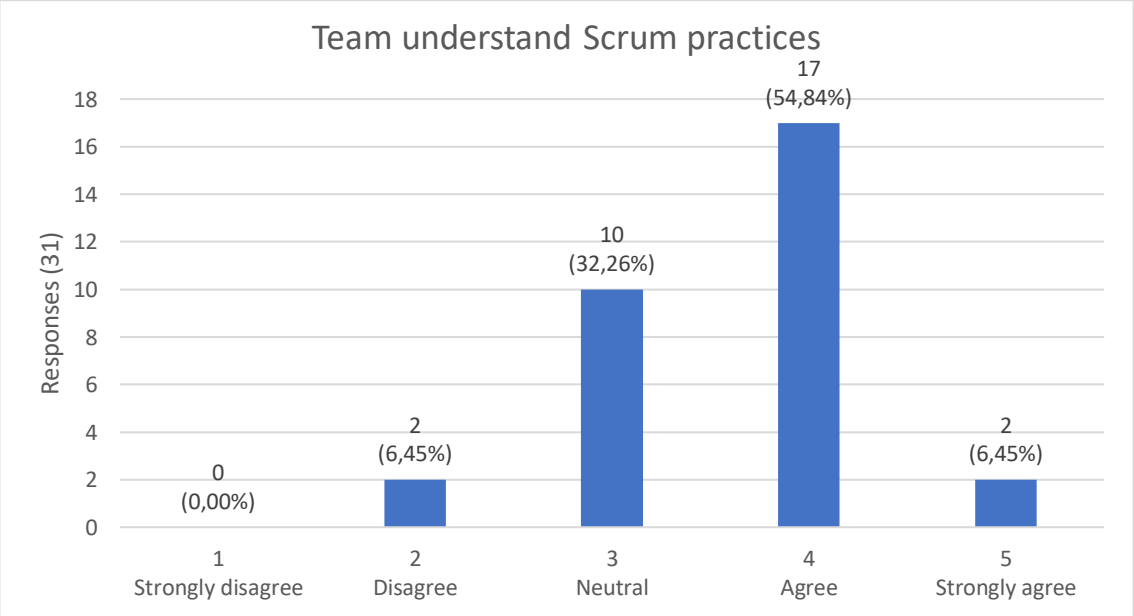

Figure 5. Teams Scrum practices knowledge.

Figure 5 results only tell the Scrum team's own opinion about their knowledge of Scrum practices. It is not the exact indicator of real competence of the teams. It can still tell the trend of teams' knowledge of basic agile practices.

Large-scale agile transformation started 2017 in the case organization. In this questionnaire there was a question about learning the SAFe. Most of the teams did not have any SAFe training at that time. There was a question in this survey on how many of the teams have been learning about SAFe. Most of the teams who answered in this survey chose option 1 which means that they had not learned about SAFe at all. Five of the teams answered option two and only two of the teams answered option three which is a neutral answer. Chart of the overall answers can be seen in Figure 6.

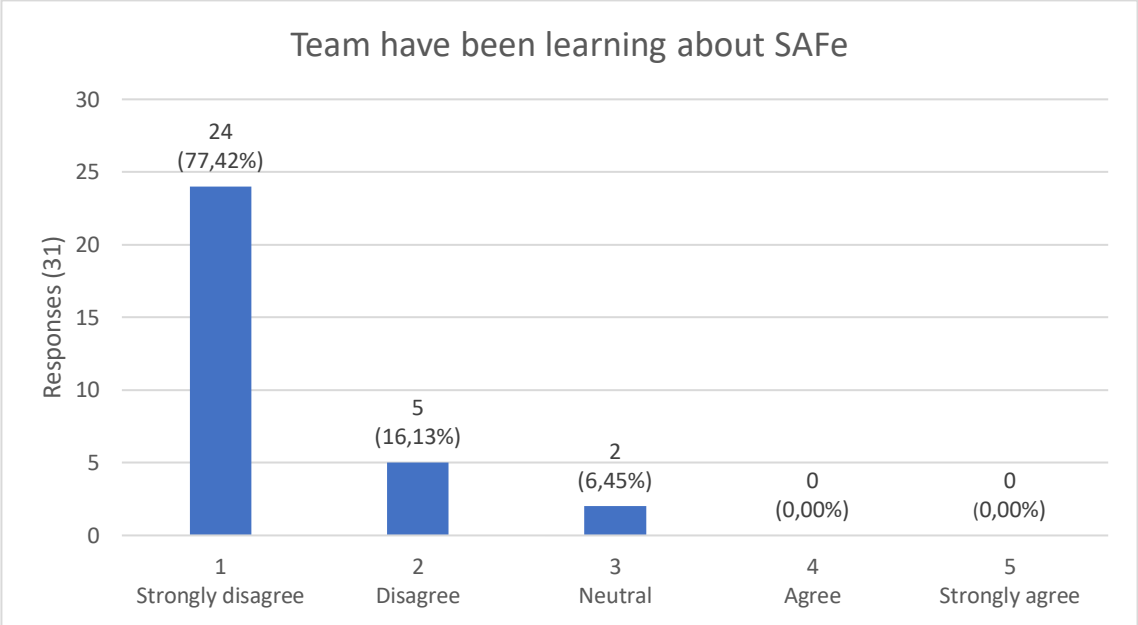

Figure 6. Previous learning about SAFe.

Teams who answered option two or three probably had some team members which had used the SAFe framework in other organizations. There is also the possibility that some of the individual developers had learned about SAFe in their free time because SAFe documentation is freely available for everyone.

There were three different questions about SAFe roles in the organization. Survey asked the teams do the developers know about other position's responsibilities outside Scrum team. Questions asked that did teams have knowledge about Product Owner (PO), Release Train Manager (RTM) or Release Train Architect (RTA) responsibilities. In the case organization Release Train Manager can be compared to Release Train Engineer in the complete SAFe. Release Train Architect can be compared to Solution Architect in the complete SAFe. These three questions were questions with "Yes" and "No" answers. Most of the teams feel that they know the Product Owner's responsibilities. Other roles were more unknown for teams.

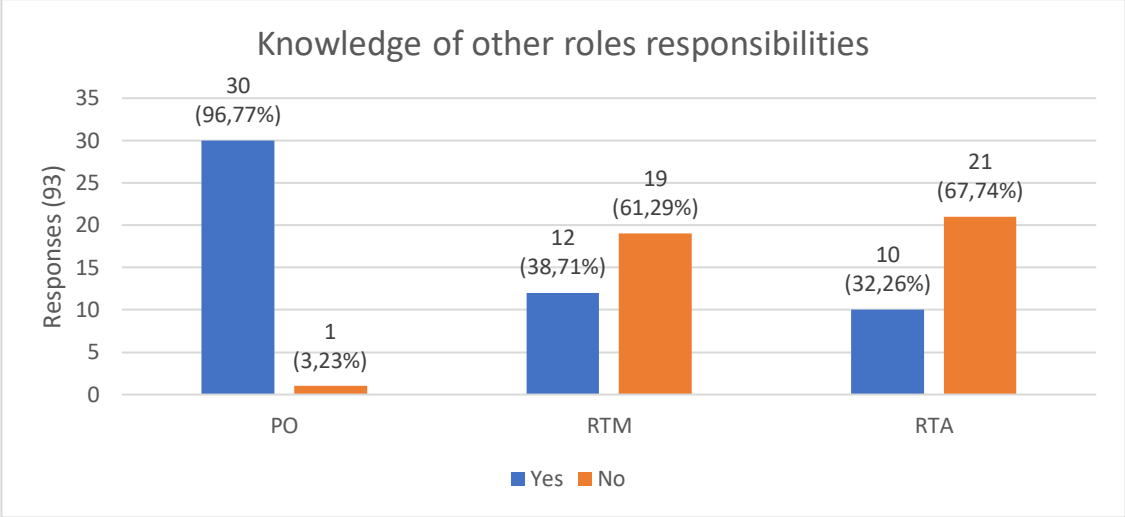

Figure 7. Teams knowledge of other roles responsibilities.

As seen in Figure 7, Scrum teams know Product Owner's responsibilities very well. Release Train Manager and Release Train Architect responsibilities were more unfamiliar in Scrum teams.

In this first phase questionnaire, there was a question which asked if the team's backlog has well-defined items for up-coming iterations. This question basically asks the team's opinion about their Product Owner's work with backlog. This question had answers in all the options from one to five. Most of the answers were in the range between disagree and neutral. Figure 8 shows overall results of the question.

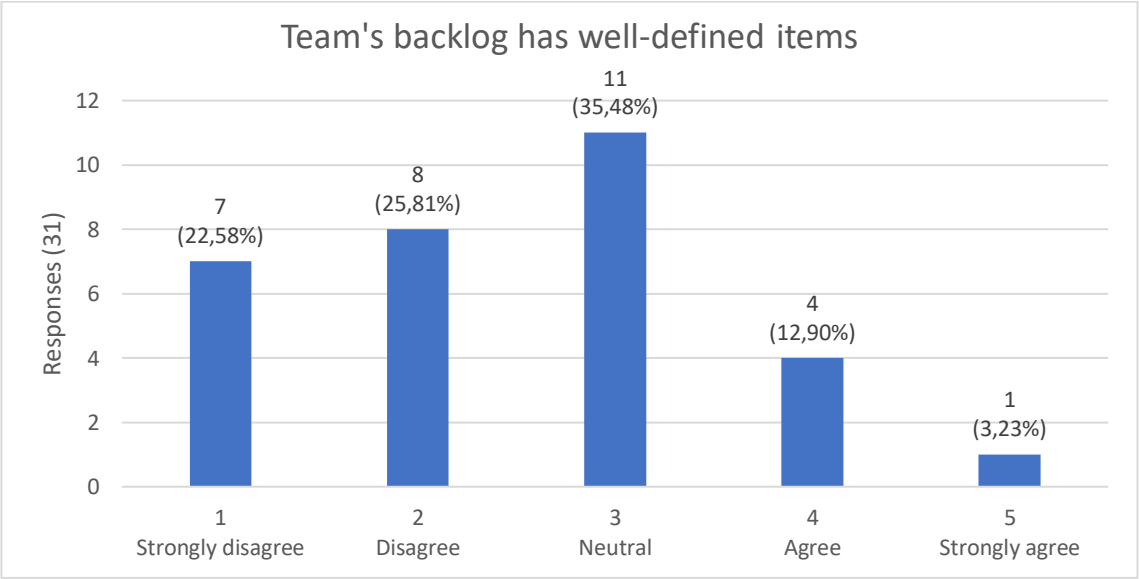

Figure 8. Teams opinion of backlog maintaining

There were also two different free-form questions in the questionnaire. These questions were "What coaching would your team like to receive?" and "Is there something that is slowing your team down?". Both questions received a lot of technical answers but there were also answers related to agile practices. Nine of the teams answered for the first question things related to agile practices, large-scale agile framework roles or SAFe. It tells that many teams did not have the necessary agile knowledge at the time. Also, this result tells that the teams want to learn agile related information. For the second question 11 of the teams answered that they have problems with the requirements. They said that

the requirements of the tasks are poor, the backlog is not well-defined, and teams did not have a clear set of goals on what to do. Also, some of the teams mentioned that they have too much stuff outside of planned sprints.

4.2 Second quantitative questionnaire

The second quantitative questionnaire was held in the October of 2019. This questionnaire round was organized one week before the SAFe training for the Product Owners. It maps the Product Owner's knowledge of SAFe before the training. It also paints a picture of the current situation regarding the working habits in the case organization. This questionnaire was held for the Operative Product Owners and Area Product Owners. There were 27 participants in this questionnaire. Questionnaire participants were working in Finland, Sweden and India at that time.

Two (7,41%) of the respondents were working in India, one (3,70%) was working in Sweden and 24 (88,89%) of the respondents were working in Finland. All the respondents were working with a different number of products. 15 Product Owners had 1-3 products in their daily work. Four of the respondents had 4-6 products and 8 of the respondents had over 6 products. This means that some of the Product Owners work only with one team and others had multiple teams to work with.

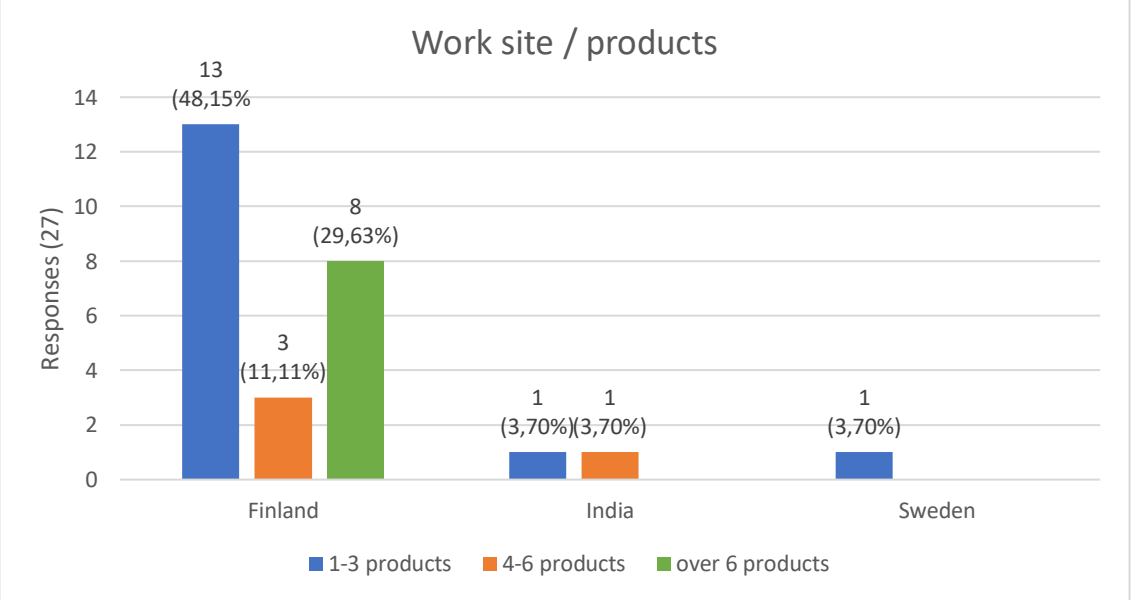

Figure 9. Product Owners' work site and owned products

Figure 9 shows that in India and Sweden there were no Product Owners that had over six products, but the sample size was smaller than in Finland.

There was a set of questions related to employee's knowledge about the ways of working and SAFe responsibilities in their organization. This question set includes eight different questions. These questions started with "I know what" or "I understand what" sentences. This question set measured basic feelings about the current knowledge of employee competence related to the organization's large-scale agile framework. The Question's answer options were divided to 5-point Likert scale and only one option was possible to select. Questions in this set were for example "I know the development process in our organization" and then the respondent can select the answer between 1 to 5. Table 5 shows each of the questions in the question set and answers per questions.

Table 5. Question set questions and answers from scale Strongly Disagree to Strongly agree.

Questions	Answers (27 per question)				
	SD	D	N	A	SA
1. I know the development process in our organization.	1 (3,70%)	2 (7,41%)	4 (14,81%)	15 (55,56%)	5 (18,52%)
2. I know what an OPO is responsible for.	0 (0,00%)	0 (0,00%)	4 (14,81%)	15 (55,56%)	8 (29,63%)
3. I know what an APO is responsible for.	2 (7,41%)	0 (0,00%)	9 (33,33%)	12 (44,44%)	4 (14,81%)
4. I know what a Release Train Manager is responsible for.	2 (7,41%)	4 (14,81%)	10 (37,04%)	8 (29,63%)	3 (11,11%)
5. I know what a Release Train Architect is responsible for.	2 (7,41%)	4 (14,81%)	8 (29,63%)	10 (37,04%)	3 (11,11%)
6. I know what definition of done is.	0 (0,00%)	2 (7,41%)	4 (14,81%)	11 (40,74%)	10 (37,04%)
7. I understand what is needed to be able to do Continuous Delivery	4 (14,81%)	3 (11,11%)	6 (22,22%)	11 (40,74%)	3 (11,11%)
8. I know other positions responsibilities in SAFe process (Developer, scrum masters, tester etc.)	4 (14,81%)	4 (14,81%	5 (18,52%)	12 (44,44%)	2 (7,41%)

In this first question set there was a question that “I know what an OPO is responsible for”. OPO means in this context the Operative Product Owner which is the appointment for the Product Owner in the case organization. There was also the question that “In your opinion, what are the Product Owner responsibilities”. This question was a free form question where the respondents had the possibility to answer with 200 characters. This free form question collected 17 responses overall. These free form answers were compared to Product Owners’ responsibilities in SAFe. For this comparison there were listed six points of Product Owner responsibilities from SAFe. These six points were used as metrics in data comparing. In the comparing phase every free form answers’ content has been checked to see what metrics are included in the answers. The full data comparing set with questions can be found from Appendix D. Listed main points of Product Owner responsibilities were:

1. Defining stories. (M1)
2. Prioritizing and maintaining the team backlog. (M2)
3. Iteration planning. (M3)
4. Quality control. (M4)
5. Accept stories as done. (M5)
6. Working with product management, customers, business owners and stakeholders. (Customer proxy) (M6)

(Scaled Agile, Inc 2020)

Limitation of this comparison was that there were not any recommendations of the correct points in question, but a lot of answers did not list any of these metrics or only one. Also, some of the answers were not so well described so if the answer was even nearly correct the point was marked.

In Figure 10 there is presented how many points answers had overall. For example, if 3 out of 17 answers had mentioned that one of the Product Owners' responsibilities is defining stories (M1) then it is showing in chart that 3 (17,65%) answers included this point in their answers.

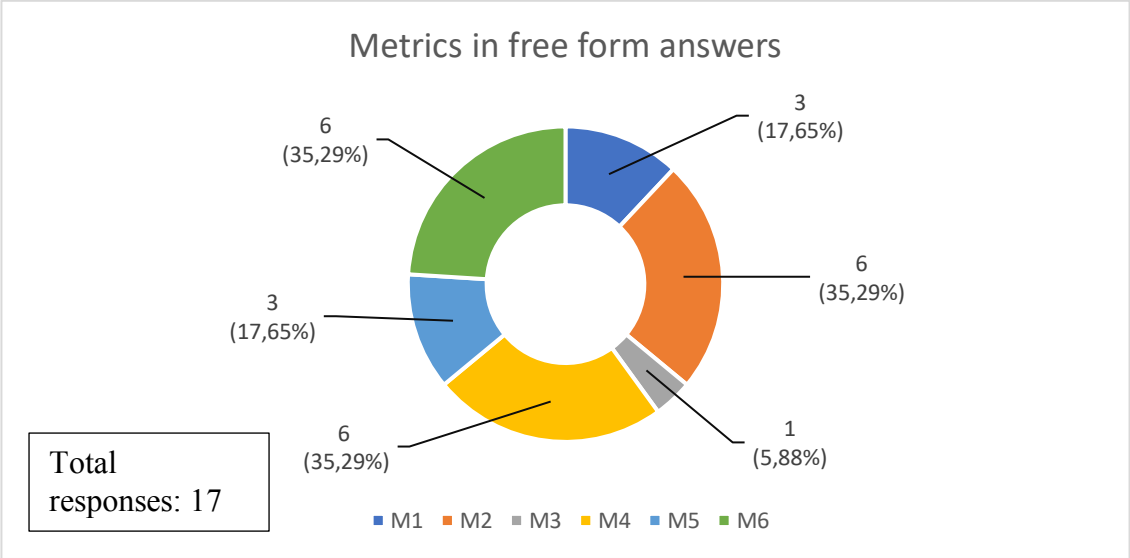

Figure 10. Free form answers measured with quantitative metrics.

The results tell that Product Owners the most familiar responsibilities are prioritizing and maintaining the team backlog (M2), quality control. (M4), and working with product management, customers, business owners and stakeholders. (Customer proxy) (M6). Only one of the 17 answers mentioned iteration planning (M3) as a part of Product Owner responsibilities. Overall results tell that most of the Product Owners think that they know the responsibilities of the Product Owner work but in reality, most of the Product Owners still have gaps in their knowledge. This questionnaire was held before the training round in October 2019.

One of the main priorities in Product Owner's task is prioritizing and maintaining the backlog. In the first questionnaire in 2017 there were clear signs that teams' backlogs were not at the desired level. Many of the teams said that they have unclear backlogs and requirements. This questionnaire had a question related to backlog maintaining. The question was "My backlog has well-defined items for up-coming iterations." None of the respondents had answer option five in this question. Even though there were not any option five answers, still there were many answers in options three and four. Only one of the respondents answer option one in this questionnaire. Results of the question are shown in the bar chart in Figure 11.

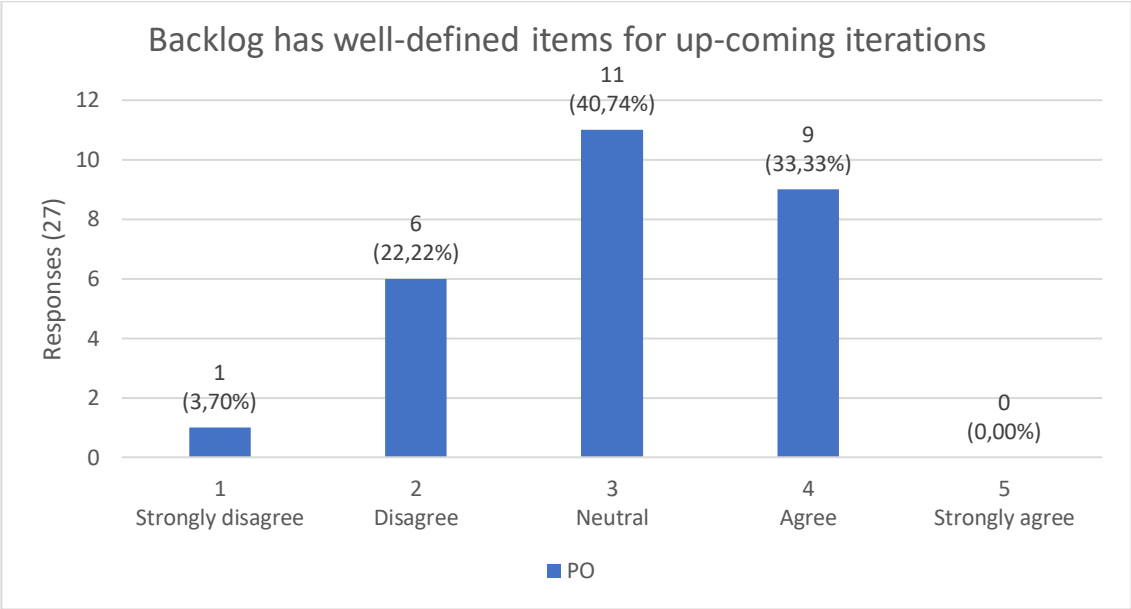

Figure 11. Product Owners' opinion of their items' definitions on backlog

In the upcoming training backlog definition should play a huge role. Compared to questionnaire one answers, this tells that backlog maintaining is still lacking behind. It helps all the developers, Scrum masters and testers in their daily work if backlog maintaining is in a good shape.

First questions focused more on Product Owner's duties but there was a question about other positions responsibilities also. Product Owners work very closely with Scrum teams and Scrum masters. One of the questions measured knowledge of the other positions' responsibilities in the SAFe process. The question was "I know other positions responsibilities in the SAFe process (Developer, Scrum master, tester etc.)". Distribution of the answers was wide. All the options from 1 to 5 get answers and most of the answers were in option number four, which tells that the Product Owners think they know other position's responsibilities well. Figure 12 shows overall results.

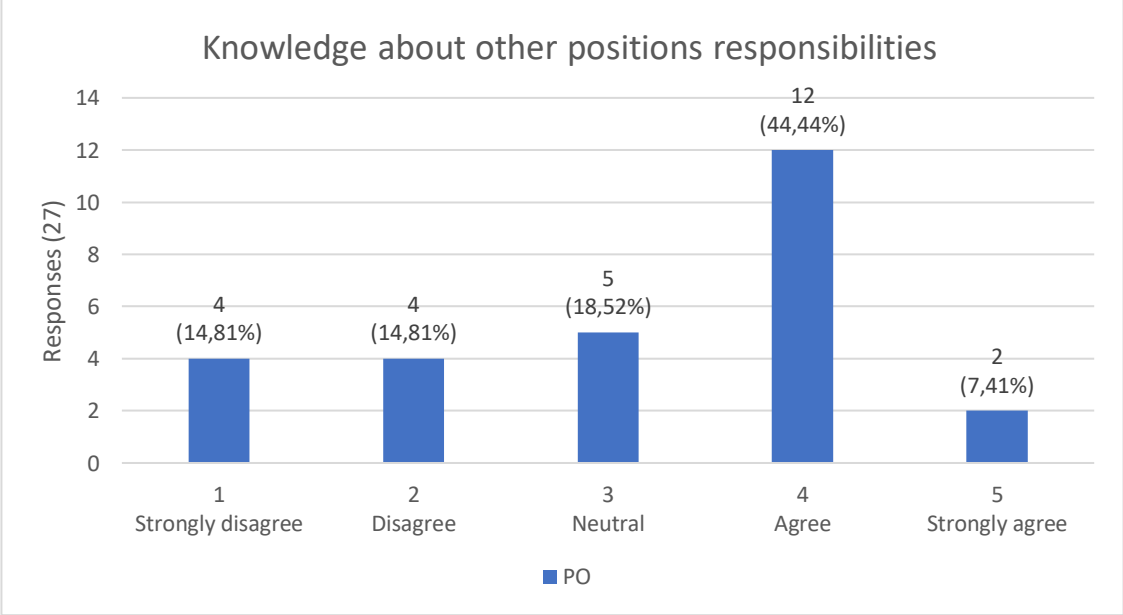

Figure 12. Product Owners' opinion of their knowledge of other positions responsibilities in large scale agile.

Even though it is not necessary to know all the tasks of other positions, Product Owners still play a key role in large-scale agile development.

4.3 Interviews

The main topic of the interviews was large-scale agile training in case organization. Interviews were held via Skype because the coronavirus pandemic forced us to work remotely. All the individuals were interviewed in a personal interview which only the interviewer and respondent attended. Interviews were held in March 2020. In this chapter there are questions, answers, and the purpose of each question. All the main questions are listed in bullet points and under every bullet point there is a gathered answer of the all four respondents and comparison between the answers. All the main themes are collected and below the last bullet point there is a summary of main themes of the answers.

- What is the interviewee's role and history in the case organization?

The first question of the interview was the straightforward starting question. This question's purpose was to clarify the respondent role, history in the current position and role in the transformation process. Before the interview it was already known that there will be employees from different roles and positions in these interviews. One purpose was also to clarify the respondent's role in the planning of training in the case organization. All the respondents are listed in Table 6.

Table 6. Respondent role, history in the current position, role in transformation process, date and duration.

Respondents	Role / position	History in the current position	Role in large-scale agile transformation	Date and duration
Interviewee#1	Solution Train Manager	Started in March 2019	When he started his role the solution level process was about to start in the organization. Release trains were already up at this time. Own role in large-scale agile transformation is modeling the solution train, PI planning coordinating and other activities related to that.	Date: 16.03.2020 Duration: 26:45 minutes
Interviewee#2	Manager (Line responsibilities)	Started in March 2019	Training responsibilities. Planning the large-scale agile training for the employers. Planning the activities, so that the organization is doing the right things in large-scale agile transformation.	Date: 18.03.2020 Duration: 39:12 minutes
Interviewee#3	Head of Operational Development	Started in December 2018	Try to deploy enterprise level integrity, visibility, controlling at inflows, testing activities and releasing.	Date: 19.03.2020 Duration: 20:14 minutes
Interviewee#4	Manager (Line responsibilities)	Started in March 2019	Coaching responsibilities. Has a long career in large-scale agile organization. Has a Leading SAFe education.	Date: 20.03.2020 Duration: 25:37 minutes

- What previous large-scale agile trainings are held in the case organization?

Before interviews it was already known that some of the employees already had their large-scale agile training during the last year. One of the trained groups in the organization was Product Owners. Related to this information one of the subtopics in this question was "why do Product Owners get the first training in the case organization?". This question's purpose was to give information as to why all the employees had not yet received education related to large-scale agile. Second subtopic was how the training provider was selected for the previous training. This subtopic purpose was chosen to support the information of reasons behind the planning process. It also leads the question to the

financial point of view. Last subtopic was “did any other than Product owner positions get training already?”. Purpose of this subtopic was to map the current situation of the training in the case organization. Before the interview there was already known that Product Owners had their training 5 months ago but there was no information on the other roles’ training.

Regarding the first subtopic all the respondents mentioned that APOs and OPOs are in the key roles of large-scale agile transformation. Product Owners were the first group the organization trained in October 2019. External training providers are quite expensive, which is one reason why OPOs and APOs were trained first in their own training. Interviewee#1 mentioned that developing teams do not differ much from basic agile principles. They are still following Scrum or Kanban practices even though the organization operates with large-scale agile practices. According to Scrum method, teams must follow some of the large-scale agile practices like PI planning and working together with the Product Owner. That is also one of the reasons why for example development teams did not get the training in the first phase. According to Interviewee#4 “Usually teams are trained last because their impact on the whole process is the smallest in the organization. Teams operate mostly in one area only”. Which indicates that the teams’ trainings are not so urgent.

Second subtopic in this question was how the training provider was selected. All the respondents had quite the same answer that the training provider was selected from among the organization partners. It was a basic tendering process and this current training provider was selected after the process. There is a list of the organization's partners in the organization’s internal shop.

The last subtopic in this question was “did any other positions than Product Owners get any training?”. There were also other roles and positions which got the training. Example Release Train Managers, some of the Scrum Masters and other managers who also had the large-scale agile education. These positions did not get the exact same training, but they were in SAFe training which was related to their role. Release Train Managers and other managers were in Safe for Leaders training. Scrum Masters were in SAFe for Scrum Masters training and so on. The other positions’ training was not as controlled as the Product Owners' training. All the Scrum Masters did not participate in the training because some of the Scrum Masters had participated lately on other Scrum Master’s training. All the persons who did not have Scrum Master training lately participated in SAFe for Scrum Master course.

- What are the planned future trainings in the case organization?

Purpose of this question was to get information about the coming large-scale agile training in the case organization. There were four subtopics in this question. First subtopic in this question was is there any further training for Product Owners. Scaled Agile Inc provides advanced level SAFe training, so the main purpose was to know that are there any plans to educate Product Owners more on the SAFe framework. It was known that the organization uses their own large-scale agile framework, so one purpose was to get information about upcoming internal trainings. Next subtopic was how the other roles and positions (than Product Owners) will be trained. The important information related to this topic was, will all the employees get SAFe certified training or only the internal process training. Third subtopic was when will the other roles be trained if they are trained. Fourth of the subtopics was that will the organization use an external training provider also in the future or will the trainings be held by internal coaches. This subtopic purpose was to give information of the motivation to educate all the employees.

Unanimous answer for the first topic was that there are no planned SAFe trainings in the future for Product Owners. All the respondents thought the same way that Product Owners now have their SAFe knowledge after the training. The next step for Product Owner training is that all the Product Owners will get the internal process training. Case organization uses their own large-scale agile framework. There are some similarities with SAFe, but the framework is not a pure SAFe framework. That is why it is important that all the Product Owners will next get the internal process training. Also, when Product Owners get the internal processes training, they already have knowledge of the pure SAFe and then they will also have the knowledge about internal processes which are not pure SAFe processes. After these internal trainings, managers will also have a view on does the organization have working processes or should something be changed.

Second subtopic was how the roles and positions (other than Product Owners) will be trained. There are planned SAFe trainings for individuals in the future. For this question there was not a straight answer on how this will be handled in the future. Some of the respondents answered that there are planned trainings for some, and others said that there might be a planned mass SAFe training for all the employees in the product development unit. All the positions are planned to be trained for internal processes. During the interviews there were lots of other things going on in the organization. During the interview, the Finnish government declared state of emergency in Finland and that is why the managers did not quite know when all the trainings would be held. First idea was that the trainings will be held in the spring of 2020, but this might change.

Third subtopic was that will the organization use an external training provider also in the future or will the trainings be held internally. According to Interviewee#4 “Individual developers cannot train internally to SAFe because the organization doesn’t have a certified SAFe trainer”. This means that organization did not have licensed SAFe training providers so if there are future SAFe trainings, they will also be held by external trainers. SAFe is a commercial framework so that is why the training provider must have a license for the training. Internal process training will be held by the organization's own trainers.

It seems that the main goal for the upcoming training is that all the roles know their job in the organization. Some of the positions are very similar to the pure SAFe framework but there are also positions in the case organization which are provided from the organization’s own large-scale agile framework. Internal training will play a huge role in the transformation. Not only the pure SAFe framework training.

- What are the most important topics and objectives of the trainings in large-scale agile transformation process?

This question purpose was to get perspective of the interviewee’s opinions about the training’s contents. This question had two subtopics. First subtopic was what are the most important topics of training in the interviewee’s point of view. Purpose of this topic was to get information if all respondents emphasize the same goals regarding the training. Second subtopic was what do you think the training should provide for employees. This subtopic aims to give the same answers but gives a little different point of view to the question if the question itself does not tell enough.

For this question almost all the respondents had very similar thoughts about the main goals of the large-scale agile training. It is very important for all the employees that they understand their own role. This means that they know which actions are related to their job description and which are not. It is important to understand their own role’s stakeholders and role descriptions and jobs of the people who are working closely with the employee daily. All the employees should understand the organization’s operational

framework in high-level, but it is not as important to fully understand someone's role who is not working as closely on day-to-day basis. Organizations try to get out of the situation that OPO's say that they do APO's jobs and the other way around. Interviewee#1 and Interviewee#3 also mentioned that it is very important for everyone to understand the Product Increment Planning. PI planning is a new thing which is coming from large-scale agile transformation. According to Interviewee#3 "One of the important topics is Definition of Done. It is important that we can trust that every team knows their role in the process flow". This means that the definition of done should be handled the same way with all the teams.

- Are there already some visible successes or failures related to previous training?

Purpose of this question was to give information about short-term effects of training in the transformation process. First subtopic of this question was are there any successes in the large-scale agile transformation already after the training. The second subtopic was are there any visible failures or problems after the training related to transformation process or training.

Measuring successes in this point of transformation might be hard, but the respondents found some successes already. One of the successes which three out of four of the respondents answered was that these trainings sparked discussion among the Product Owners. Before the training all the Product Owners just did their job the way that someone told them. In the training they get the perspective for large-scale agile operating model. After training the Product Owners had their own thoughts about the large-scale agile and they shared the thoughts with each other because all the Product Owners gathered for the same training in the same location. After the training Product Owners seem to understand really what is meant to be Product Owner. Interviewee#4 also mentioned that some Product Owner's backlog is much more well-defined than before the training which is a very good sign if the result is compared to 2017 and 2019 questionnaires.

One of the problems rose above the others with many of the respondents. As mentioned above in this study, the case organization does not use a pure SAFe framework in their organization. Still the training came from pure SAFe training providers. There are some roles in the case organization which are not the same in their large-scale agile framework than SAFe. Example APO and RTM are these kinds of roles which are not coming straight from SAFe. In these SAFe trainings some people get confused because organization's way of working does not match straight to the SAFe framework. According to Interviewee#2 "Perhaps employees should have prepared better for the training. Training goals should have been set more clearly on what are the goals of the training and how to proceed after the training". Which indicates that employees did not exactly know what to focus on in the training. The main idea was that the Product Owners first go to the pure SAFe training and learn the basics of large-scale agile in SAFe this way. After that they will go to the internal training and modify their knowledge to the organization's framework. Currently this way causes some confusing and misunderstandings within the employees.

- How high you rank the importance of trainings in the large-scale agile transformation process?

Purpose of this question was to get respondents' opinions about the importance of training in large-scale agile transformation. This question gives information from the perspective of different roles in the transformation process. Respondents were working in different roles with each other, so it is important to see that all the employees in the planning group

have the same goals. This question did not have any subtopic because it is such a straightforward question.

For this question all the respondents answered that the training is quite important in the large-scale agile transformation. There were still some different opinions on how important training is in the priority of large-scale agile transformation. Interviewees #2 and #4 answered that training is very useful and important in large-scale agile transformation. They said that it is important to give the employees a possibility to understand the whole workflow of the process. Because of training employees can understand why organizations do this kind of transformations and it gives a sneak peek on how to handle large-scale agile processes in the organization. Interviewees #1 and #3 also think that trainings are important in the large-scale agile transformation, but they do not raise the importance of education as high as interviewees #2 and #4. According to Interviewee #1 "I do not see any benefit for the organization if all the employees have three-day training where everyone learns the basic terminology of SAFe". Which indicates that it is probably not the best solution to put all the employees to the three days long training camp. He also said that it is more important to give training to the key persons and then they can spread the knowledge to the lower levels. More like hands on training.

- What is the current status of the agile knowledge in the organization?

The main subtopic in this question was how the organization can be sure that for example Scrum teams have knowledge about basic agile practices before moving to large-scale agile. People have different backgrounds in the large organization, so how can they be sure that every employee has the necessary agile knowledge before the transformation process. The second topic in this question was how to handle the basic knowledge of agile principles before large-scale agile training. This question leans on Paasivaara et al., (2018) comment that basic training of the agile practices is necessary before the employee starts to modify agile.

All the respondents had the same thoughts about this. This is something which has received less attention in the organization. During the interview there was a culture in the organization where managers assume that everyone is proficient in basic agile practices. There is no common alignment in the organization about the basic agile training. Couple of the respondents mentioned that it would be great to arrange basic agile training for the people who do not have prior experience of agile principles. During the interview, the culture in the organization was that when a new employee joins a team, the team handles the "agile training". According to Interviewee#4 "Currently we assume that if a new software developer comes to our organization, he knows the basic agile principles. It has become clear that this is not always the case". Which indicates that all of the new employees do not have agile knowledge. There is agile training video material on the internal web, but this training is not mandatory for employees. This is something that needs to be considered in the future.

- How to support or improve employees' large-scale agile knowledge after training?

This question was related to future actions after all the trainings are held. How to handle new employees' large-scale agile knowledge and how to maintain large-scale agile knowledge in the future when transformation goes forward. This question had two subtopics: how to handle new recruits' large-scale agile knowledge after training and are there any planned maintenance activities for maintaining employees' large-scale agile knowledge after training?

Respondents answered that this is something which has been considered in the transformation planning. When a new employee comes to the organization, they should be forwarded to the SAFe training right away. After the employee has had basic SAFe training it is followed by the internal process training which gives education for the organization's own large-scale agile framework. Also, it would be great if current employees who already have SAFe certificates would renew their certificate after a certain time. It is also important that managers give the possibility for employees to grow to the SAFe thinking. During the interview case organization did not have an Agile Coach position in their organization. Interviewees #2 and #4 thinks that this could be helpful in the future. Interviewee #3 also mentioned that it would be great to arrange a mentor for the new employee. Interviewee#3 mentioned "The most important thing is that a person gives guidance to another person". This indicates that a mentor would be helpful with the basic questions about the processes in the organization and other questions. It is important that a new employee does not start his/her journey alone. Basic large-scale agile training should be part of the new employee's integration plan.

- Free comments related to trainings in large-scale agile transformation

In the end of the interview there was a free comments section. This section gave great information related to this study. Respondents mentioned that the transformation process is still going but it is still almost at the beginning during these interviews. In Finland there are not many organizations that have as large product development unit as the case organization has. According to Interviewee#1 "Most of the SAFe trainings do not provide solution level education. It is not supported very well in the SAFe training. This is one of the reasons why we need to make our own framework". Which indicates that it gives its own challenges to the transformation process and training because there is no benchmark for this large agile transformation.

4.4 Summary of results

This chapter gathers all the results from questionnaires and interviews. There was a lot of quantitative and qualitative data in these three surveys, so in this chapter there is a summary of the results which have straight connection with each other.

4.4.1 Backlog maintaining

One of the common things for all the surveys was lack of knowledge about maintaining the teams' backlog. The first questionnaire was held for the teams and there were lots of comments about unclear requirements, unclear goals and bad backlog maintaining. In the second questionnaire 6 out of 17 Product Owners answered that backlog maintaining is one of the Product Owner responsibilities. This means that 11 of the 17 respondents did not mention anything related to team backlog maintaining even though it is one of the core things in the Product Owner's job. Interviewees respond that one of the main goals of the training was that the Product Owners know their responsibilities better, but before the training this was in a bad shape. Interviewee#4 mentioned that backlog maintaining tools could be one thing that might be the plan of the future internal training agendas.

4.4.2 Roles in large-scale agile

Many of the respondents in questionnaires did not knew very well the other positions than their own. In the large-scale agile company, there is a huge number of different roles and like interviewees said in the qualitative survey, main thing is to know the positions which works close in employee's own position. In the second questionnaire Product Owners knew very well the roles which are working close to Product Owner but roles which are far in the organization chart were still unclear to most of the Product Owners.

One problem in the case organization was that they use their own large-scale agile framework, which is based on SAFe, but still have their own roles which are not coming straight from the SAFe framework. According to the interview's responses the problem is that the employees get confused in SAFe training when some of the roles in the organization match the SAFe roles and other roles do not. For example, the training which was held to the Product Owners in 2019 was a pure SAFe training. These trainings did not have any info about Release Train Managers, Area Product Owners, Solution Train Managers, Release Train Architects. There are lots of matching points with SAFe roles, but Product Owners did not quite catch the connection between case organization roles and SAFe roles.

4.4.3 Basic agile knowledge

Employees must have basic agile knowledge before transferring to a large-scale agile framework. Currently there is an assumption in the case organization where everyone knows the basic agile practices and it is included in the employees' general knowledge. Still in the first questionnaire there were raised flags that this is not the situation in the case organization. Many teams wanted to get more knowledge about agile practices. In the qualitative interview's respondents answered that this is something which is not handled systematically during this time in the case organization. It was not measured in any quantitative way that how many of the employees have learned agile practices before starting their new job in the case organization but clearly there are employees who do not have the agile knowledge or they feel that they do not know agile as much as they should.

4.4.4 Trainings

Above in this study there were already mentioning about the SAFe trainings and the organization's other own trainings. The trainings which were held to the Product Owners, managers, and some Scrum Masters in 2019 were pure SAFe trainings. The situation in the organization is that the case organization uses their own large-scale agile framework. In the interviews it was pointed out that the people's preparation by managers before the training was incomplete. In the training people were confused because of different roles which were not the same as in case organization. This problem also produced good things. After the training, the Product Owners had more knowledge about large-scale agile and this raised questions, concerns and discussion between employees.

One thing which arose in interviews was the lack of common goals related to the training. Respondents had different opinions about coming to the training. Some of the respondents thought that the training is more important than others. Other respondents wanted to train all the employees for the basic SAFe knowledge and others thought that only the specified large-scale agile roles are important to train.

5. Discussion

This research main idea was to find how to improve the implementation of large-scale agile transformation through training. In this chapter the results which are collected from questionnaires and interviews are discussed. This chapter also answers two research questions of this study.

5.1 The importance of trainings

One of the failure factors in large-scale agile transformation is lack of training. Lack of training might cause problems during the transformation process in the organization. Adding training to an organization is a direct cost (Dikert, Paasivaara & Lassenius, 2016). Training is one way to add agile competence to employees in the transformation process. There are many different large-scale agile frameworks and organizations can also use their own modified frameworks. In the case organization there was an own, modified framework in use, which had similarities with the SAFe framework. There were still many differences between SAFe and the case organization's own processes. Paasivaara et al. (2018) mentioned that insufficient common training may lead the transformation process to the wrong direction. That is why it is important to plan a clear training path for all employees to avoid that problem.

There were SAFe trainings for different positions in the case organization. All the training participants went to SAFe training which was related to their role in the organization. For example, the Product Owners went to the "SAFe Product Owner" course and some of the Scrum masters went to the "SAFe Scrum Master" course. It is important that Scaled Agile Inc. provides training courses for all of the positions. SAFe training gives good basic knowledge of the large-scale agile because it has been planned for very large companies. In this study one of the problems in the SAFe training is that the organizer of the SAFe training must have a certificate to do that and a certificated external training provider may not know exactly what kind of modified framework is in use in the case organization. This means also that SAFe training is quite expensive for the large-scale agile transformation organization. It leads to the situation that only the key roles are trained during this time in the case organization.

In this study's case organization had their own large-scale agile framework. This framework had some of the same roles which are listed in SAFe, but the organization also had other roles which are not straight from SAFe. Because of that the organization had planned to train all the employees with their own internal training related to organization processes. These training sessions were not held during this study, so these trainings were still under development. One of the biggest challenges related to trainings in this study was that SAFe and the organization's own framework use different terms. When for example the Product Owners went to training in October 2019 they were confused because these trainings did not have any information about for example the Area Product Owner. APO is a very common role in the case organization. Dikert et al. (2016) mentioned that this kind of lack of knowledge about used framework might stop teams using agile methods entirely. Lack of knowledge might affect a team's motivation if they do not know the processes that the organization requires (Dikert et al., 2016).

The main idea of the large-scale agile transformation is the change from the basic agile team level principles to one big integrated framework on enterprise level. Before this can be fully supported, individual employees must know the basic principles of the agile.

Paasivaara et al. (2018) listed that one of the problems in the transformation process is that employees do not have enough knowledge about agile basics before transformation and the basic agile training should be mandatory for all employees before the transformation process. In this study the following question was in the interviews: “what is the current status of the agile knowledge in the organization”. The answers varied between the respondents a bit, but the main result was that during this time there is no tracking of employees’ basic agile knowledge. Management assumes that every person knows basic agile principles in the IT-sector. If some new employee is unfamiliar with agile principles, then other teammates teach these principles to the new employee. This assumption is just the same as in Paasivaara et. al case study organization in 2018.

Training content can vary in the SAFe training between different roles. This is something which must be also considered in the internal process training. One of the respondents in the interviews mentioned that it would be great to give some role specific training also in the internal training. This is necessary because all the roles did not get all the role specific information from the SAFe training because these roles might not be invented in SAFe. Also, one respondent mentioned that for example the Product Owners might get some training related to backlog tools etc. This would be an important approach to the internal training. In questionnaires there were a lot of findings related to poor backlog maintaining. The Product Owners should have had training for backlog tools as well. It might help with the problem of backlog maintaining.

5.1.1 Research question 1 and implications

The research question related to this topic was:

RQ1: How to improve the implementation of large-scale agile transformation through training?

Interviews and questionnaires gave very valuable data related to this question. The biggest challenge was the misunderstandings between SAFe roles and organization’s own roles. There are multiple ways to avoid these kinds of challenges in the future. One of the respondents mentioned that there was not proper preparation for the employees before the SAFe training. The main idea in the organization was that the employees get the basic large-scale knowledge via SAFe training and then they can shape their knowledge to internal processes. If this is the main idea, then it should also be made clear for the employees. Before employees go to the SAFe training it is necessary to prepare employees for it. They should know that the organization will not use a pure SAFe framework and there might be different roles in the organization than in the SAFe training. If some organization roles are missing from the SAFe training, these roles will be explained in the internal process training. It is important for the employees to know what the main goals of the training are, so the employees can focus on the training’s valid parts better. This was a problem in the Product Owners’ SAFe training, but this can be avoided in the future trainings for example if other roles go to the SAFe training.

The second problem was that there was a long interval between SAFe training and internal process training. The confused period related to roles between SAFe and case organization can be avoided if the internal training is held almost immediately after the SAFe training. If the interval between SAFe and internal training is shorter, then the employees can be fully focused on the used framework instead of using their energy to understand the roles and positions of the used modified framework.

The third problem was that there is not any tracking of basic agile knowledge in the organization. Many of the interviewees mentioned that this is a problem which is not considered in the case organization at the time. During the interviews this formed a discussion. There is basic agile training already in the organization's intranet, but this training is not mandatory for the employees. Paasivaara et al. (2018) mentioned that basic agile training should be mandatory for achieving the common goals of the large-scale agile transformation. For the future, this study's case organization could use the same approach. All the employees in the product development unit should go through these training sessions and if a new employee comes to the organization, agile training should also be mandatory for the new employee. In this way organization can avoid gaps between employees' agile knowledge.

This paragraph is the summary of implications for the case organization. The Organization should provide better preparation for employees before upcoming large-scale agile training. Employees should know the common goals of the training and not just go to the training blindfolded. Management can for example prepare and deliver some starting material before the training. The Case organization can use short but information rich training periods. This period could have SAFe training and internal process training. It reduces employee's confusion between differences in SAFe and internal processes. Third thing is that all the employees should have basic knowledge of the agile principles before they start to transform their processes to the large-scale agile framework.

5.2 Trainings target groups

Adopting large-scale agile to the whole organization might be very complicated. It gets more complicated if the organization is very large. All the employees must have the same mindset in the organization. One way to try to secure this mindset is large-scale agile training for the whole organization (Dikert, Paasivaara, & Lassenius, 2016). Currently in this study's case organization only a couple of roles had participated in a certificated SAFe training. These roles are management related roles, the Product Owners and some of the Scrum masters who did not have any prior Scrum master training or those who had done Scrum master training a long time ago. This means that most of the employees had not participated in any large-scale agile training yet. During this study large-scale agile transformation had already started in the case organization.

Scaled Agile Inc. provides SAFe training for all the different roles in SAFe. There are for example trainings like SAFe for Teams and Agile Software Engineering (Scaled Agile Inc, Provider of SAFe, 2020). It means that all the employees have customized training in the SAFe training catalog. The one problem is that these trainings are quite expensive for the companies. In the interviews of this study a couple of respondents answered that the one reason why key-roles are the only ones who went to the certified SAFe training was money. Because training is always a direct cost for the company, that is why management must think which roles are best to train first if the company does not have the possibility to train all the employees at the same time. SAFe training providers must have a certificate to do that, so this raises the costs of the training in the company.

During this study, the roles which had completed the certified SAFe training were the Product Owners, some of the Scrum Masters, the Line Managers who did not have earlier SAFe knowledge, the Release Train Managers, and some other managers. The main goal for the earlier SAFe training in the organization was that it is necessary to give SAFe training for all the Product Owners. Management decided that way because the Product Owners have a very important key-role in the large-scale agile. The result of the

questionnaire before the SAFe training also told that Product Owners did not have very much knowledge about their responsibilities. This result also supports the idea that the Product Owners had to get knowledge about their responsibilities. The Software Developers, Testers, Scrum masters etc. already had clear responsibilities without large-scale agile training, but the Product Owners might not know their responsibilities because this role comes straight from large-scale agile. The result of the questionnaire before the training also told that the Product Owners might think that they know their role's responsibilities, but the truth might be different from their initial thoughts.

Upcoming trainings target groups are still a little unclear in the case organization. Some of the respondents in the interview answered that there will not be further SAFe training, but all the employees will get the internal process training. Some of the respondents said that the idea of the future training is that all the employees will get SAFe certified training in mass trainings. Even the developers and testers. The answers vary with respondents so there is not a congruent answer regarding future trainings. All the respondents are still thinking the same about the internal process training. They said that all the employees will get this training. The target date of these trainings is still unclear, but the plan was that these trainings will be held during the year 2020. Dikert et al. (2016) mentioned in their research that all the employees should have the same mindset in the transformation process. Case organization's approach varies on this opinion. In 2017 questionnaire teams said that they want to get more agile and SAFe training. If this 2017 questionnaire wishes are compared to 2020 actions, it is visible that teams are still lacking behind in SAFe knowledge.

5.2.1 Research question 2 and implications

The second research question was:

RQ2: Is it mandatory to provide large scale agile training to all employees who are involved in the transformation process?

This research question's answer can vary depending whether this should be viewed from a financial point of view or from success of transformation point of view. In this study there is no data about financial figures in the case organization, so this research question will be viewed from success in transformation point of view. One of the semi-structured interview respondents told that all the employees should get SAFe certified training. If this transformation process is compared to prior research this is the good approach for the training's target groups. As stated above, all the employees must have the same mindset in the transformation process. It can be only reached by giving the same opportunities for all the employees with training. If basic agile knowledge is an important prerequisite for all the employees, the SAFe knowledge is also important before moving to a modified framework. This is because the modified framework is based on SAFe practices. With certificated SAFe processes, the management can be sure that all the employees are starting in the same line when moving to large-scale agile.

There is a big difference between specific large-scale agile roles which comes from large-scale agile framework and other roles in the organization who are still part of the SAFe process. Specific roles in this context are the RTMs, POs, RTAs. These roles did not exist in the organization before the transformation process started. Other roles in this context are the software developers, testers, Scrum masters etc. These roles can operate without SAFe knowledge but how well will they fit to the organization's processes is another question. One of the respondents in the interview answered that even though the

organization uses modified large-scale agile framework the developer's work uses almost only basic agile practices in their work. He mentioned that there are some terms like PI planning that developers must know in their daily work. If the organization will not give the possibility of SAFe training for all the employees, it is good that all the employees will get the organization's internal process training.

Answer for the research question is that it is mandatory to provide large-scale agile training also to the other roles than specific large-scale agile roles. Currently in the case organization there are three different types of training areas related to Agile. These training areas are certified SAFe training, internal large-scale agile process training and voluntary basic agile training. Related to these training areas all the employees must have basic agile training and internal large-scale agile process training during the transformation process. Giving the right training for every employee is very useful and with this action the failure of the transformation process can be avoided. It is not mandatory to give SAFe certificated training for all the employees because some roles do not work with large-scale agile practices as much. For the basic developers and testers, the good approach would be to give less theoretical training and more practical training related to Agile development. The theoretical training part can be much smaller for developers than for the roles which have wide large-scale agile responsibilities in the organization. Examples of these roles which have wide responsibilities are the Product Owners, Release Train Managers and Release Train Architects. Theoretical training part for the developers and testers can include teaching of basic large-scale agile principles and most common roles in their everyday job. Conboy et al. (2011) mentioned that mentoring from senior employees to juniors is an efficient way to produce continuous training and learning to the inexperienced employees. This approach is used during this study in the case organization. Related to Conboy et al. (2011) study, the formal training is still needed. Everyone must know the basic principles of the large-scale agile. Compared to Dikert et al. (2016) prior research of the large-scale agile training for all the employees is mandatory, so that all the participants of the transformation have the same direction.

6. Conclusions

This study aimed to answer the importance of training in large-scale agile transformation. This study gives answers to what points should be considered when planning large-scale agile transformation and which groups should be trained in the large-scale agile organization. In this study there was one case organization which is going through the large-scale agile transformation process. The case organization had already arranged training related to large-scale agile transformation, but they also had upcoming trainings during this study. This study also aimed to give implications for the company on how they can improve the organization's training processes.

The results show that during the large-scale agile transformation process, every employee in the organization must have the same mindset about agile development. Related to prior research, training has an important slot in the large-scale agile transformation. Improving the implementation of the large-scale agile transformation through training needs preparation, planning and common goals from the managers. By training, employees get a clear vision of why the transformation process is done. Results of this study shows that the training path must start from the basics of agile and then move to the large-scale agile training. It is not appropriate to assume that every employee knows the agile principles in the organization.

Results of this study and the prior research shows that all the employees should get large-scale agile training during the transformation process. This prevents the possibility of the transformation process failure. Training paths should be modified according to the job description. Developers and managers should not go through the same training path, but both roles should have basic knowledge of the used large-scale agile framework. Every employee must know the used framework and agile principles before transformation is completed.

Proposal for the case organization is that every employee should have basic training related to the organization's own large-scale agile framework. This training should include large-scale agile principles in the organization, all the roles and the common goals so employees can modify their mindset to the organization's framework. Also, a second noticeable proposal is that basic agile training should be mandatory for all the employees in the product development unit. It is a clear result from the collected data that this is lacking behind. Basic agile training is one of the core points in the prior research related to the transformation process.

Large-scale agile transformation is a hot topic now in 2020. Large-scale agile research field is still quite new but agile methods themselves are settled into the IT-companies around the world. Almost everyone who works in the IT sector will face these methods in the future so studies related to the agile transformation process will be very relevant in the next few years.

6.1 Limitations

There were a couple of limitations to this study. The first limitation was that there was only six months' time slot for this study. First training was held in October 2019 and this study was ready in April 2020. It is hard to get real info about the training in such a short time. Large-scale agile transformation process might even take a couple of years, so it

was impossible to measure concrete results of the employees' competence in their own role.

The second limitation was that the first questionnaire was held to teams. Scrum teams answered for the questions as a team. This might distort the results because in teams there might be persons with different personalities. Some of the individuals might affect all the team members' opinions. This questionnaire was held before this research started and these results are only used in this study. This questionnaire was not planned for this study. Better way to arrange this kind of questionnaire is to ask the questions from the individual employees. In that way results might be more detailed.

Third limitation was that there is not as much SAFe related scientific research available because SAFe itself is a commercial framework for large-scale agile. There is a lot of large-scale agile research but not SAFe related. This study focuses a lot on SAFe practices, so it limits the prior research. Also, SAFe is constantly evolving. Some of the prior research articles which were found contained old information.

Fourth limitation was that this study investigates only one case organization. Thus, there are limitations to the generalizability of the results. This study gives perspective only on the case study organization point of view. In this study there were only four semi-structured interviews and these interviews were held employees of the same unit. This might give little bit narrow results.

6.2 Future research

The result of this research shows that training is still something where companies save money during the transformation process. One future research topic could be the financial view of the transformation process. It can investigate which actions spend the most money during the transformation process. Lack of training seems to be one of the main failure factors during the transformation process but still it is recurring in the transformation processes regardless of the company.

The second future research topic could be to quantitatively measure a large-scale agile transformation and training's effect to transformation process. This could be done as a case study with a couple of different companies. Olszewska et al. (2016) offers quantitatively measuring metrics for transformation. These metrics can be used as a base for the future research. This kind of study can provide concrete data of the effects of training in the transformation process. Paasivaara (2017) made study where she compared two different case organizations with different training paths. This study gave qualitative results, but the author of this study did not find any research which measures these problems in a quantitative way.

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Appendix A. First questionnaire (2017)

Eight relevant questions which were picked from 84 questions.

Question	**Question Type**
We have been learning about SAFe	Radio-button
We understand Scrum.	Radio-button
We know what an OPO is responsible for.	Radio-button
We know what a Release Train Manager is responsible for.	Radio-button
We know what a Release Train Architect is responsible for.	Radio-button
Our backlog has well-defined items for up-coming iterations.	Radio-button
What coaching would your team like to receive?	Free form
Is there something that's slowing your team down?	Free form

Appendix B. Second questionnaire (2019)

Question	Question Type
Location	Radio-button
Position	Radio-button
How many products you have?	Radio-button
I have been learning about SAFe	Radio-button
I know development process in our organization.	Radio-button
I know where to find information about the Ways Of Working.	Radio-button
I know what an OPO is responsible for.	Radio-button
I know what an APO is responsible for.	Radio-button
I know what a Release Train Manager is responsible for.	Radio-button
I know what a Release Train Architect is responsible for.	Radio-button
I know what definition of done is.	Radio-button
What is the lowest level of backlog item I'm responsible for?	Radio-button
My backlog has well-defined items for up-coming iterations.	Radio-button
I understand what is needed to be able to do Continuous Delivery.	Radio-button
I feel that test automation benefits us.	Radio-button
I feel that test automation benefits us.	Radio-button
I work together with Product Services.	Radio-button
I know what DevOps means in our organization.	Radio-button
Briefly describe what you expect from DevOps.	Free form
I have visited customer and seen how a user interacts with our product in real life.	Radio-button
I am willing to visit customer that uses our products.	Radio-button
I have done user testing with actual users.	Radio-button
My products are using the following technologies	Checkbox
My products contain test automation with following technologies	Checkbox

In your opinion, what are the Product Owner responsibilities	Free form
In my opinion, we follow SAFe practices in our organization at the moment	Radio-button
I feel that we gain benefit from SAFe to our development process	Radio-button
I know other positions responsibilities in SAFe process (Developer, Scrum masters, tester etc.)	Radio-button
I feel that I can easily get the information related to SAFe process from organization's internal network (WIKIAs, Intra etc.)	Radio-button

Appendix C. Semi-structured interview body

1. **What is interviewee's role and history in the case organization?**
   - Role? How long career in the current position? Role in large-scale agile transformation? etc.

2. **What previous large-scale agile trainings are held in the case organization?**
   - Why do Product Owners get the first training in the case organization?
   - How the training provider was selected?
   - Did any other positions than Product Owners get any training?

3. **What are the planned future trainings in the case organization?**

   - Is there any further training for Product Owners?
   - How the other roles and positions (than Product Owners) will be trained.
   - When?
   - Will the organization use an external training provider also in the future or will the trainings be held by internal coaches?

4. **What are the most important topics / objectives of the trainings in transformation process?**
   - What are the most important topics of trainings in your opinion?
   - What do you think that trainings should provide for employees?

5. **Are there already some visible successes or failures related to previous trainings?**
   - Are there any successes in the large-scale agile transformation already after the training?
   - Are there any visible failures or problems after the training related to transformation process or training?

6. **How high you rank the importance of trainings in the large-scale agile transformation process?**

7. **What is the current status of the agile knowledge in the organization?**
   - How to handle some people lack knowledge about agile? In the large organization, people have different backgrounds with agile basics.
   - How to handle the basic knowledge of agile principles before large-scale agile training?

8. **How to support or improve employees' large-scale agile knowledge after trainings?**
   - How to handle large-scale agile knowledge with new recruits after trainings?
   - Are there any planned maintenance activities for maintaining employees' large-scale agile knowledge after trainings?

9. **Free comments**
   - If anything, to add for the above questions? Or any other comments.

Appendix D. Product Owner responsibilities data comparison

Verbatim	Defining stories.	Prioritizing and maintaining the	Iteration planning	Quality control.	Accept stories as	Working with product
Product owner ensures that delivery happens with quality , drives the product backlog for team , helps team to deliver work items in time		x		x		
Keep products and work quality in level high enough, support my team in their work.				x		
Own, prioritize and maintain the product backlog. Create and accept user stories. Be responsible What-part and When-part for products.	x	x			x	
High quality and timely product delivery with correct content				x		
Ensure the developers are working efficiently and on the right items. Key person between team and customer.		x				x
Always add value to customers						x
Customer voice towards development team.						x
To maintain the quality of the products				x		
Responsibilities are unclear between OPO, APO, RTM, STM						
Backlog prioritization, creating features/ stories to backlog, increment and sprint planning with the team, goal definition for the sprint, approving features with DoD perspective, taking responsibility of product's quality, co-operation with PS, release acceptance/	x	x	x	x	x	x
Be the customer voice in PD-team. Create Features, support pd-team by clarifyine the equirements. Approve the deliverable content of product.	x				x	x
To have the team working with the right things						
Ensured that we deliver products with high quality based on well organized backlog to teams		x		x		
Backlog, teams work and contact to the customers		x				x
Ensure that team is doing the right thing						
Enables team to work according to APO prioritization						
Totals	3	6	1	6	3	6